

REVISION OF THE GENUS *TRECHALEA* THORELL (ARANEAE, TRECHALEIDAE) WITH A REVIEW OF THE TAXONOMY OF THE TRECHALEIDAE AND PISAURIDAE OF THE WESTERN HEMISPHERE

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ABSTRACT. The spider family Trechaleidae, introduced by Simon in 1898 but abandoned immediately thereafter, is defined. Characters proposed for trechaleids by recent authors for this family and some characters used to separate it from the Pisauridae and Lycosidae are reviewed. Genera included in the family Trechaleidae, all of which were previously placed in the Pisauridae, are: *Trechalea*, *Hesydrus*, *Syntrechalea*, *Dossenus*, *Paradosenus*, *Dyrines* and *Enna*. Familial placement of all other genera of the western hemisphere previously placed in the Pisauridae are considered.

The genus *Trechalea*, with eleven species, is revised. Redescriptions of eight known species are given: *T. longitarsis* (C. L. Koch), *T. cezariana* Mello-Leitão, *T. macconnelli* Pocock, *T. paucispina* di Caporiacco, *T. connexa* (O. Pickard-Cambridge), *T. extensa* (O. Pickard-Cambridge), *T. gertschi* Carico & Minch and *T. amazonica* F. Pickard-Cambridge. Descriptions of three new species: *T. boliviensis*, *T. lomalinda* and *T. trinidadensis* are presented. The holotype of the type species of *Trechalea*, *T. longitarsis*, is lost. The specimen which was previously regarded as the holotype is mislabelled and belongs actually to another, unnamed, trechaleid genus. All other relevant species names not synonymized with any of the above and not previously placed in *Trechalea* are removed to other known genera or will be later included in new genera.

In the early 1970's I began a series of revisions of the American Pisauridae with *Pisaurina* (Carico 1972) and *Dolomedes* (Carico 1973). The immediate goal was to clarify the taxonomy, at the genus and species levels, which would establish the required base for a later analysis at higher levels. The traditional family Pisauridae was retained as a matter of convenience with deferral until later of the re-examination of the family taxon itself.

While working on a group of primarily Neotropical genera, including *Trechalea*, I became aware that they represented a monophyletic clade which challenged the limits of the traditional family Pisauridae. This group of genera was therefore set aside for special consideration and was used as a basis for a study of the family-level taxonomy.

Of the seven genera placed here in the family Trechaleidae Simon, six were described around the turn of the century by Simon and the Pickard-Cambridges. These genera include *Hesydrus* Simon (1898a), *Syntrechalea* F. Pickard-Cambridge (1902), *Dossenus* Simon (1898b), *Paradosenus* F. Pickard-Cambridge (1903), *Dyrines* Simon (1903) and *Enna* O. Pickard-Cambridge

(1897). *Trechalea* Thorell (1869) was described approximately thirty years earlier.

Simon apparently realized that he was studying a group of unique spiders when he, rather cryptically, inserted a two-line notation of the new family Trechaleidae in his summary of 1890. No description was offered and only the reference to two genera, *Dendrolycosa* and the type genus *Trechalea*, was given. He never again referred to this family and continued (1898) to name new species of the genus *Trechalea* in his old family Pisauridae.

During a meeting of the International Congress of Arachnology, I reintroduced the Trechaleidae (Carico 1986), erroneously referring to this family name as a *nomen oblitum*. At that time I presented a provisional cladogram showing its relationship to the families Pisauridae and Lycosidae, with the Pisauridae as the probable sister group.

The complexity of the Trechaleidae combined with the rather close relationship of the genera made it highly desirable that all possible material be examined before formal publication of a family analysis was attempted. Only after examining all available related type specimens and collec-

tions scattered in numerous museums was I able to sort out the genera and species. It then seemed necessary to revise the entire family at once before any generic revision could be published to provide what was believed to be the proper foundation for a secure set of family apomorphies. As a result, much time was required to bring the project to completion.

In the meantime, various authors have examined specimens of the family and have generally also concluded that the Trechaleidae represents a distinct group and is probably a valid family. Sierwald (1990), in her efforts to work out the higher taxonomy of the American Pisauridae, has shown through an excellent study of the male genitalia that the "*Trechalea* genus-group" represents a distinct taxon from the Pisauridae and that the Lycosidae is the probable sister group of her "*Trechalea* genus-group." Griswold (1993) confirmed, by a preliminary cladistic analysis of the Lycosoidea, the distinctness and monophyly of the Trechaleidae and placed the family as the sister group of the Lycosidae. Dondale (1986) listed family level synapomorphies for the Lycosidae, and further noted that the family shared some of these characters with *Trechalea*.

To date no complete treatment of the family has been presented nor have any of its included genera been revised. It is my intention in this paper to revise the genus *Trechalea* and to review the taxonomy of the family Trechaleidae in reference to the related families Pisauridae and Lycosidae. Later, revisions of the remaining six described genera and new genera will follow. A summary of their phylogenetic relationships and a key to their identification will also be presented at the appropriate time.

METHODS

Careful dissections of unexpanded palps were conducted to learn the relative positions of the various components, as in the approach of Dondale (1986). This method develops a good understanding of palpal structure that makes possible comparisons among different genera because all palpi in this unaltered condition are more likely to be similar. Expanded palpi were also studied, but expansion by its very nature, causes distortion in positional relationships which inevitably results because of difficulty in controlling the degree of expansion. Comparisons between specimens of different genera were therefore much more difficult on palpi in this state.

To study epigyna, the soft tissue was removed by a combination of dissection and immersion in KOH or a proteolytic enzyme. Since the internal parts were often dense and dark, they were immersed in Chlorox (sodium hypochlorite solution), as per the method of Griswold (1993), until only the internal lining of the ducts was uncleared. In addition, to trace better the tubules, the cleared, alcohol-saturated structure was allowed to air dry completely, which causes the silvery trace of the lumen to appear when the structure was reimmersed in alcohol.

Drawings were made with pen and ink, using a Bausch & Lomb Stereozoom® Microscope equipped with eyepiece drawing grid and micrometer. The right palp was illustrated from the ventral and retrolateral positions. SEM micrographs of the median apophysis and tibial retrolateral apophysis at ventral view are provided for comparison and diagnosis. Epigyna were drawn from the ventral view with setae removed, and from the dorsal view, uncleared, with the soft tissue removed.

Measurements are in mm. As an index to the size of the body, only the length of the carapace is given because of variability in the condition of the abdomen. Generally, the length of the abdomen is approximately equal to the carapace length in males while the abdomen may be somewhat longer in females. Eyes or eye group measurements were made with the surface plane perpendicular to the axis of sight. Abbreviations and additional notes pertaining to eye group measurements are in Table 1.

Museum abbreviations.—AMNH—American Museum of Natural History; BMNH—The Natural History Museum, London; CAS—California Academy of Sciences; EXPE—Exline-Peck (now in CAS); FMNH—Field Museum of Natural History; INPA—Instituto Nacional de Pesquisas Amazônica; JAK—J. A. Kochalka; JEC—J. E. Carico; MACN—Museo Argentino de Ciencias Naturales, Buenos Aires; MCN—Museu de Ciências Naturais, Fundação Zoobotânica do Rio Grande do Sul; MECN—Museu Equatoriano de Ciências Naturales, Ecuador; MEG—M. E. Galiano; MCZ—Museum of Comparative Zoology; MZUCR—Museo de Zoología Universitaria, Costa Rica; REL—R. E. Leech; USNM—National Museum of Natural History.

Abbreviations of anatomical terms for genitalia.—Many anatomical terms and abbreviations of genitalia were adopted primarily from Sierwald (1989, 1990) while others were coined for

purposes of this paper: *ab*—accessory bulb of epigynum; *af*—anterior field of the epigynum; *bs*—base of spermatheca; *c*—conductor; *cd*—copulatory duct; *cdd*—copulatory duct diverticulum; *co*—copulatory opening; *cy*—cymbium; *dd*—dorsal division of median apophysis; *e*—embolus; *eb*—embolic base; *ecd*—ectal division of the retrolateral apophysis of the male palpal tibia; *epf*—epigynal fold; *eg*—embolic groove; *end*—ental division of the retrolateral apophysis of the male palpal tibia; *ep*—epigynal plate; *fd*—fertilization duct; *g*—guide (part of *ma*); *hs*—head of spermatheca; *ifa*—internal fold of anterior field; *ll*—lateral lobes; *ma*—median apophysis; *mf*—middle field of the epigynum; *p*—petiolus; *pma*—posterior margin of anterior field of epigynum; *rta*—retrolateral tibial apophysis; *s*—spermatheca; *sd*—sperm duct; *ss*—stalk of spermatheca; *st*—subtegulum; *t*—tegulum; *ti*—tibia; *vcm*—ventral cymbio-tibial membrane of the palpal tibia; *vd*—ventral division of median apophysis; *vp*—ventrodiscal protuberance of male palpal tibia; *vr*—ventrodiscal rim of male palpal tibia.

Family Trechaleidae Simon

Trechaleidae Simon, 1890:82, type genus *Trechalea* Thorell, 1869. Bonnet, 1955-1959:4680; Carico, 1986:305; Coddington & Levi, 1991:22, (cladogram); Griswold, 1993:1-39.

Dolomedae (in part), Simon, 1898a:301.

Dolomedidae (in part), Lehtinen, 1967:372.

Diagnosis.—The family Trechaleidae can be distinguished from the Lycosidae by the presence of: a retrolateral apophysis and a ventrodiscal refolded rim on the male palpal tibia (Fig. 7), the posterior eye row (PE) in a single recurved row, and eyes in two rows.

In only the Pisauridae, in comparison with Lycosidae and Trechaleidae: the female produces a nursery web (a matrix of irregular webbing surrounding the egg sac and upon which the female sits and defends against intruders), in some species the male binds the female's front two pairs of legs with silk during copulation, and a unique tubular retreat with associated resting behavior is constructed by some species.

The Trechaleidae can be distinguished from both the Lycosidae and Pisauridae by: the male palpus which has a large distally situated median apophysis equipped with a dorsal embolic groove that extends distally into an apical guide (Fig. 7), the presence of a discoid egg sac carried only on the spinnerets, presence of a "skirt" on the seam

of the discoid egg sac (Fig. 6), transport of young on the empty egg sac, and non-reattachment of dislodged egg sac.

Description.—Very large (body length up to 21 mm, leg span up to 167 mm; *Trechalea cezariana*) to small (body length down to 3.5 mm, leg span down to 18 mm; undescribed genus and species), entelegyne, araneomorph, ecribellate, lycosoid. Carapace low to moderately low, about as wide as long with cephalic area moderately distinct to indistinct, longitudinal fovea distinct. Eyes viewed from above in two rows, PE row recurved, subequal in size, approximately equidistant and separated by about an eye diameter, AE row straight or nearly so, always smaller than PE, ALE smaller than AME; ocular quadrangle wider above, about as high as wide. Clypeus height variable. Sternum about as wide as long, truncated anteriorly and acute posteriorly. Labium free, length-width ratio may be greater or lesser than 1.0. Chelicerae vertical, base robust, often enlarged anteriorly on males, promarginal teeth three, equidistant with middle one largest, retromarginal teeth variable between three and five in number varying in size and distribution. Endites longer than wide, parallel.

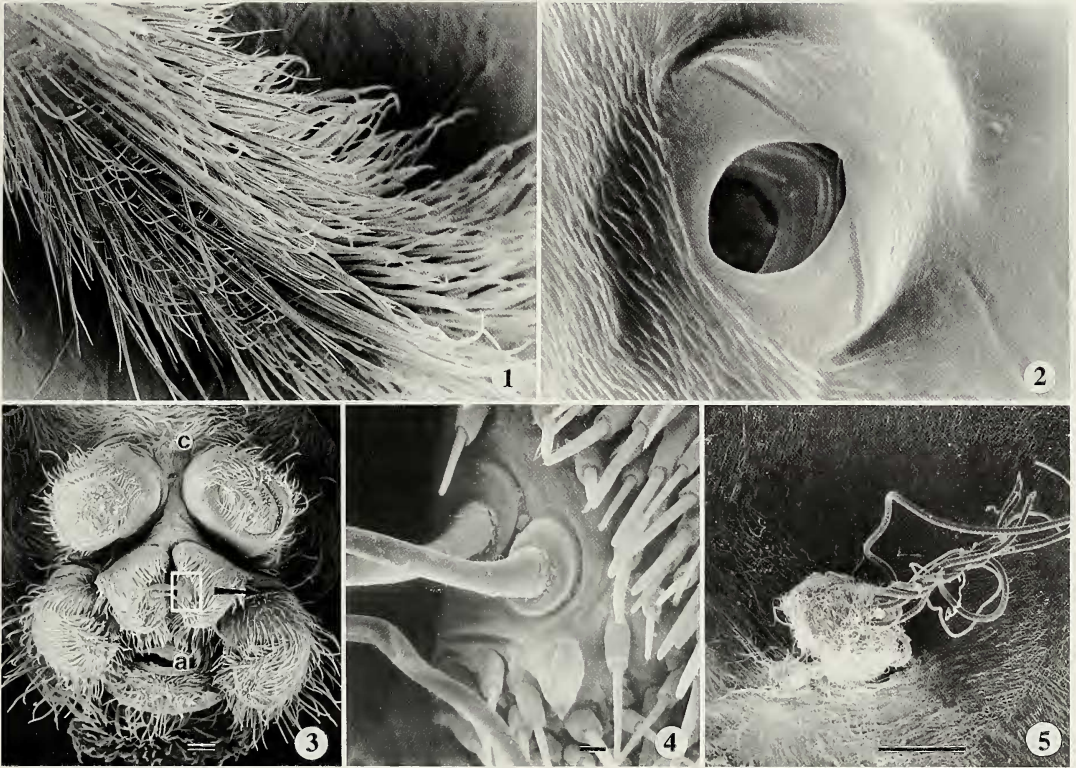
Abdomen oval, low, somewhat flattened ventrally, moderately covered with setae, often patch of setae present ventrally and anterior to spinnerets, no plumose setae found. Six spinnerets and colulus present. Tracheal spiracle located just anterior of colulus.

Male and female genitalia are described below.

Legs generally long, slender, often with flexible tarsi (Fig. 1), and, in some species, flexible metatarsi. Coxae notched ventrally. Third legs always shortest but relative lengths of other legs vary. Large macrosetae present on most segments, found in varying numbers of pairs on ventral surfaces of tibiae and metatarsi. Long setae, often curved at tips (Fig. 1), present mainly on ventral surface of legs. Trichobothria: tarsi with two rows and in alternating position, metatarsi with one row, tibia with cluster near proximal end with few others scattered distally, femur none. Bothrium (Fig. 2) with hood distinct, angled laterally, not ridged or embedded. Tarsi and metatarsi may be scopulate (Fig. 1) with one median and two lateral claws, all usually dentate. Female palpus with single, dentate claw.

Distribution.—The family is found entirely within the region from the Gila River of Arizona, United States southward to northern Argentina.

Natural history.—The included species have



Figures 1-5.—Scanning electron micrographs of structures of trechaleids: 1, 2, *Trechalea gertschi*; 1, tarsus, retrolateral view showing flexible integument and scopula; 2, bothrium; 3-5, *Hesydrus habilis*; 3, spinnerets (a = anal pore, c = colulus); 4, enlargement of 3 with emphasis on posterior median spinnerets, mesally located pairs of minor ampulate gland spigots with silk emerging from three of them; 5, attachment of four “carrying threads” to top valve of egg sac. Magnifications: 1, 60×; 2, 2000×. Scales: 3, 100μ; 4, 10μ; 5, 100μ.

a wide size range, and one would expect a wide divergence of habitat preferences to exist. Information is available, however, mainly for the larger species. The general impression from collection data and from personal observation is that the preferred habitat is around the margins of bodies of freshwater. Some moderate-sized species have been taken from trees and other vegetation away from water.

No species is known to make a snare of any kind and all are apparently entirely cursorial. The most aquatic species are very adept at walking on the water surface and crawling underwater in the manner familiar to the aquatic species of the pisaurid genus *Dolomedes* (Simon 1898a; pers. obs.). The feature of flexible tarsi is common in the family. The flexibility is due to a general softness of the cuticle rather than the occurrence of pseudosegmentation. This flexibility, which may be quite extensive, could be an advantage in the support and locomotion on the water surface.

No nursery web is constructed. The female carries the egg sac containing eggs or first instar spiderlings by the spinnerets, specifically the paired minor ampulate gland spigots on each posterior median spinneret (Figs. 3, 4, identified by J. Coddington, pers. comm.) in the manner of lycosids. The egg sac has a unique structure, described as hemispherical by Simon (1898a), with a generally flattened shape and with a distinct fringe or “skirt” at the seam between the two valves (Fig. 6). As the eggs hatch and the spiderlings occupy more of the internal space of the egg sac, the “skirt” is obliterated by stretching. The young emerge from the weak junction at this seam presumably without aid from the mother. After emergence, the young are carried upon the egg sac mostly on the upper valve but, with crowding above, also sometimes below. Young may also be found on the abdomen of the mother, but apparently only as a consequence of insufficient space on the egg sac and then only if they are in contact with sac-borne spiderlings. I

have not observed young only on the abdomen; when only a few young are present, they are only on the egg sac. The mother persists in carrying the egg sac and has been observed carrying it well after spiderlings have left. Only four strong lines are attached from the posterior median spinnerets to the center or near center of the upper valve, leaving a distinct single scar (Fig. 5). The female will not reattach the egg sac at any stage if it is dislodged. Both upper and lower valves are smooth on the surface, the upper usually darker and thicker while the lower is lighter, thinner, and flatter (Simon 1898a; Sierwald 1990; pers. obs.) with the eggs or young often visible.

Status of the type genus.—By reference to *Trechalea* as the type genus of the family Trechaleidae (Simon 1890), it follows that the family name therefore hinges on the type of its type species, *Trechalea longitarsis* (C. L. Koch). However, the correct identity of this species presents a problem.

C. L. Koch (1848) described a female from what is now known as Colombia with a body length of $7\frac{1}{2}$ lines (= 15.7 mm, H. Levi pers. comm.) and gave it the name of *Triclaria longitarsis*. Some important distinctive features listed in his description included the pattern of the eyes (which were figured) and the “sickle-shaped” tarsi, both of which are important identifiers of what has traditionally been considered *Trechalea*. *Trechalea* was the name later given as a *nomen novum* by Thorell (1869) to the genus because the name *Triclaria* was preoccupied by a bird genus.

Later, Karsch (1879) found a dried spider in the Berlin Museum, no. 2006, which he regarded as the specimen Koch used when making the description of *Triclaria longitarsis* because of Koch’s reference to the “sickle-shaped” tarsi. Karsch mentioned two labels with the specimen, one of which states “Brasilien, Langsdorff” and the other simply as “longitarsis?”. Noting the discrepancy of the published locality as “Colombia” and the label contained with the specimen as “Brazil,” he dismissed it merely as a change made presumably in curating. Kraus (1955) agreed with Karsch’s conclusion.

I have examined the specimen no. 2006 mentioned by Karsch and found the following: (a) The specimen is a juvenile with the body length of 12.2 mm, presently preserved in alcohol, but was apparently originally mounted dry. The presence of a hole through the carapace and sternum indicates that it was probably perforated

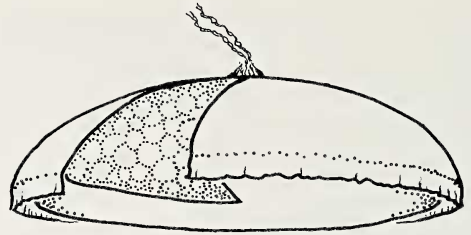


Figure 6.—Diagram of a trechaleid egg sac with “carrying threads” attached.

with a pin. Only a single entire leg is still attached; others are shattered. (b) The vial contains a total of five labels which are as follows: “2006”, “longitarsis Koch?”, “Brasilien Lgsof”, “Typus”, and a modern label which has the number, species name, etc., and the notation, “(sensu Karsch)”. The first three of these labels have pin perforations (two of which were mentioned by Karsch) and were presumably pinned originally with the specimen. The “Typus” and modern label, which were not perforated, were apparently added with the specimen after it was placed into alcohol storage.

After careful consideration of the evidence, I have concluded that this specimen, hereafter referred to as “2006,” is not the type specimen for *Trechalea longitarsis* (Koch). My conclusion is based on the following observations: (1) Koch indicated that his specimen was a “female”, presumably meaning it was adult. “2006” is a juvenile. (However, these authors, including Simon, often assumed that juveniles were females and did not look for an epigynum [Levi, pers. comm.].) (2) Koch stated that the length of his specimen is “ $7\frac{1}{2}$ ””, (or 15.7 mm). “2006” is 12.2 mm, which is significantly shorter. (3) An examination of the external characters of “2006” shows it to be a member of a new genus (which will be described in a later publication) with a distinctive carapace shape, and offset fifth retromarginal cheliceral tooth. As will be shown later, this genus is found only in the southernmost states of Brazil in the Río de la Plata drainage system, far from Colombia. Therefore, “2006” is not from Colombia, and the specimen label which has the locality “Brasilien” is probably correct. (4) The label in the vial with “2006”, “longitarsis Koch?,” placed after Koch’s description and before Karsch’s discovery, indicates that the person who pinned the label to the specimen had doubts about it, as indicated by the question mark. Therefore, uncertainty about the specimen apparently pre-

dates Karsch. (5) The “Typus” label was added after Koch, because it lacks the perforation and does not add proof that Koch made this designation himself about this particular specimen. The conclusion that this specimen was the type could have been based on the assumptions of Karsch and may have actually been added, incorrectly, by him. (6) Karsch’s conclusion was apparently promoted by the lack of other material available to him for comparison combined with an overemphasis on the distinct eye and tarsus characters that led him to make the statement that “2006” agrees exactly with the description.

The partially insect-eaten, dried, and presumably faded specimen after 30 years must have lost much of the detail, especially pattern, of the fresh specimen. Thus, the conclusion of Karsch may have been influenced by the combination of a process of elimination, misleading labels, and an overemphasis on the few distinct characters remaining on the specimen.

The above evidence leads me to conclude that “2006” is not the holotype specimen of *Triclaria longitarsis* designated by Koch. With this conclusion, one is still left with the problem about the status of the nomenclature of the genus and thus of the family. In order to provide stability of the names, I make certain assumptions based on the examination of a considerable amount of material.

I assume that the type specimen is lost and that Colombia was the actual type locality as stated by Koch. Furthermore, I assume that the most probable part of the country where the specimen was taken is that area of northern Colombia extending from the Atlantic coast to Bogotá, the most likely area that a European collector might visit. Thus, the presumed type locality is in the coastal drainage region rather than in the Amazonian drainage area. As explained later, these two drainages have distinct species of *Trechalea* which fall into the size range stated by Koch. Therefore, the *Trechalea* species found in the coastal area, is assumed to be *T. longitarsis*.

Status of unrevised “pisaurid” genera in the Western Hemisphere.—Since this work brings about some reassignments of a major group of genera from the Pisauridae (or Dolomedidae) to the Trechaleidae, it is appropriate now to summarize the familial placement of the remaining unrevised “pisaurid” genera in the Western Hemisphere. The remainder of this section is devoted to my determination of the disposition

of these genera based on an examination of the available types.

Tunabo Chamberlin (1916) is based on an immature male holotype and is a lycosid (confirmed by H. Levi pers. comm.) but was regarded as a zorid by Lehtinen (1967) and was therefore listed in the latter family by Brignoli (1983) and Platnick (1989). *Sisenna* Simon (1898a) is a junior synonym of *Architis* and is treated elsewhere (Carico 1993). Two species described by Keyserling in the genus *Tetragonophthalma* Karsch (1878), *T. granadensis* (1877) and *T. obscura* (1891), are in the lycosid genus *Porrmosa* (Cappasale 1982). *Aglaoctenus* Tullgren 1905 is a junior synonym of *Porrmosa* (NEW SYNONYMY), a decision based on an examination of the holotype of *Aglaoctenus bifasciatus* Tullgren. The genus *Dyrinoides* Badcock (1932) was described for two species which are represented by tiny, unidentifiable spiderlings; however, they may be trechaleids. *Thaumasia* Perty (1833) is a pisaurid.

The Mello-Leitão genera *Xingusiella* (1940a) and *Demolodos* (1943) (*Demelodos* [sic] Mello-Leitão 1943; *Demolodes* [sic] Roewer 1954; Brignoli 1983; Platnick 1989) are each represented by a single species, and their types are lost in the Río de Janeiro museum and are not available for examination.

A species ascribed to *Nilus* (O. Pickard-Cambridge 1876), *N. amazonicus*, was described by Simon (1898b) from the Amazon region of Brazil. The type is a large, recently molted juvenile of unknown sex which is unlike any known American pisaurid and is not a trechaleid. Since the genus is otherwise known only from Africa eastward through Australia and Simon described many spiders from other continents in his 1898b publication, it is likely that this specimen was from another area and its locality is in error.

Two species of a primarily African and Asian genus, *Hygropoda* Thorell (1895), were described by Simon (1898a) from South America. Examination of the types of these species, *H. andina* and *H. venezuelana*, shows that they actually belong to the genus *Paradossenus*.

Ancylometes Bertkau (1880) bears some ctenid anatomical characteristics, but it is probably a pisaurid because of its clearly pisaurid behavior (Merrett 1988). A study of its relationships should be conducted, but is beyond the scope of this paper.

Status of various pisaurid species assigned to revised genera of the Western Hemisphere.—

During this study, no specimen of the widely distributed genus *Dolomedes* has been found from anywhere south of the Yucatan Peninsula. This confirms the opinion of Carico (1973) that the genus has only a Nearctic distribution in the Western Hemisphere with the exception of areas of southern Mexico. There are, however, a few species in the older literature described from South America which I have considered. Giebel's (1863) description of the eyes of his *Dolomedes intermedius* from Colombia clearly suggests that it is not a *Dolomedes*. I cannot determine its genus, however, because the holotype has not been found. The holotype of *Dolomedes albicoxa* Bertkau (1880) is lost but a reading of the description indicates that this species is not a *Dolomedes* because of the strongly procurved anterior eye row and relative sizes of the eyes. It may be a *Porrmosa* or a species of *Architis*. Although the holotype of *Dolomedes pullatus* Nicolet (1849) is missing, the description of the color pattern suggests to me that this species may be a *Thaumasia*. The holotype of *Dolomedes elegans* Taczanowski (1873) is missing, but the description of the color pattern gives very good indication that it is a *Thaumasia*.

Thanatidius spinipes F. O. Pickard-Cambridge (1903:156, 157) is a junior synonym of *Staberius spinipes* (Taczanowski). NEW SYNONYMY. All of the species of *Thanatidius* listed by Bonnet (1955–1959) have been synonymized. The genus was synonymized earlier by Carico (1972) to the entirely Nearctic genus *Pisaurina*.

Previous attempts at higher taxonomy.—Removal of these seven genera from the Pisauridae (*sensu* Simon) (*Trechalea*, *Hesydrus*, *Syntrechalea*, *Dossenus*, *Paradossenus*, *Dyrines*, *Enna*) into a monophyletic family is accompanied below by an historical examination of previous schemes of higher taxonomy. At least three authors have made a significant attempt to name families or subfamilies in which these genera were included.

Simon's (1898a) placement of *Trechalea*, *Hesydrus*, *Dossenus*, *Drances* (= *Dyrines*), and *Hygropoda* into "Dolomedea" (along with other genera), indicates his concept that these trechaleid genera are closely related. However, only the American species of *Hygropoda* are trechaleids as indicated above.

Roewer (1954) assigned the genera *Dossenus*, *Dyrines*, *Hesydrus*, *Paradossenus*, *Syntrechalea* and *Trechalea* to his Thaumasiinae. However, he assigned *Enna* to his Pisaurinae.

Lehtinen's (1967) attempt to place these genera into subfamilies and into new families resulted in the following: *Trechalea* ("..Lycosoidea *incertae sedis*; probably related to Zoridae, especially *Neoctenus*."), *Dossenus* (Dolomedidae), *Dyrines* (Dolomedidae), *Hesydrus* (Dolomedidae), *Paradossenus* (Dolomedidae), *Syntrechalea* ("Position obscure, but evidently a representative of Lycosoidea."). Additionally, genera which were previously assigned to Pisauridae are assigned as follows: *Xingusiella* (Amaurobiidae: Rhoicininae), *Aglaoctenus* (Dolomedidae) and *Dyrinoides* (Lycosoidea *incertae sedis*).

STRUCTURE OF THE GENITALIA IN *TRECHALEA*

Male palpus.—The basic structure of the male palpus of *Trechalea* was described by Sierwald (1990) in her survey of various pisaurid genera. Many of her conclusions and abbreviations concerning structure are used here; a more detailed description of the anatomy is available in her paper. Additional details were pointed out by Dondale (pers. comm.).

Basically, there are four, major, articulating, sclerotized elements which make up the bulb of the male palpus, each separated by membrane(s) (Fig. 7). Beginning at the base is the 1) *subtegulum* (*st*), attached to the *cymbium* (*c*) by a large membrane, the basal hematodocha (bearing within its wall the sclerotized petiolus). Next, moving distally, one encounters the ring-like 2) *tegulum* (*t*), described by Sierwald (1990) as having several loops or "switchbacks" of the sperm duct. Attached to the membrane distal to the tegulum is the large, conspicuous, 3) *median apophysis* (*ma*), and the 4) *embolus* (*e*) which is a thin, curved structure with a broad, subdivided base (*embolic base*, *eb*; [perhaps incorporating the terminal apophysis]). The embolic base is partly subdivided by a narrow membrane. Of these, only the embolus is not usually visible when viewed ventrally in the unexpanded state.

The median apophysis is a large, complex structure that appears to have a unique form in the trechaleids (Sierwald 1990) and is located distally on the bulb where it characteristically occupies about a fourth to a third of the bulb mass. On its dorsal side is a deep, narrow, longitudinal groove, the *embolic groove* (*eg*), in which the thin part of the embolus rests and is apparently comparable to that found in some lycosids (Dondale & Redner 1983b; Roth 1985 [key]). This groove (independently discovered by Don-

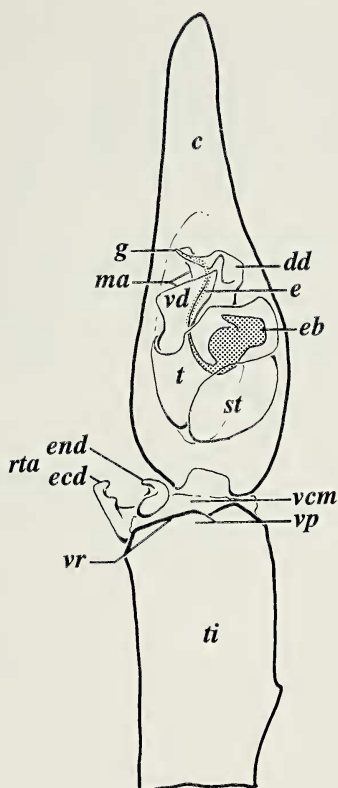


Figure 7.—Trechaleid palpus anatomy based on *Trechalea longitarsis*, ventral view. Embolus with its large embolic base in shading behind (dorsad) and showing the narrow part contained in the embolic groove of the median apophysis. Abbreviations in methods section.

dale, pers. comm.) continues distally into a curved or hooked projection arising from the *dorsal division* (*dd*), which probably serves as a *guide* (*g*) for the embolus during intromission (as is the case in some lycosids [Dondale & Redner 1978]) but seems not to support or protect the embolus at rest as with, respectively, the fulcrum and conductor found in, e. g., *Dolomedes*. In addition to the dorsal division, there is the conspicuous subdivision on the ventral side (*ventral division*, *vd*) which varies in size and shape. The shape and position of the projections arising from these divisions are highly genus- and species-specific and are given special attention in the description and figures for each genus and species.

The *palpal tibia* (*ti*) bears a distal *retrolateral apophysis* (*rt*), which in some genera may be subdivided into two parts: the *ental division* (*end*) which is surrounded by membrane (defined below), and the *ectal division* (*ecd*) usually located laterally and proximally to the ental division.

The size and shape of the retrolateral apophysis is genus- and species-specific. In addition to the retrolateral apophysis, there is a feature of the ventrodistal margin of the tibia in which the border folds down upon itself forming a depression down into the distal end of the tibia. This pit thus formed has been used as a taxonomic character of some importance by some workers (Sierwald 1990; Griswold 1993). See the section below on character analysis for further discussion of this feature and additional features of the tibia, *ventrodistal rim* (*vr*), and *ventrodistal protuberance* (*vp*), and *ventral cymbio-tibial membrane* (*vcm*).

Sierwald (1990) identified in the palpal bulbs of species of *Trechalea* and *Paradosenus* additional structures such as a conductor, terminal apophysis, etc., which are not used here for diagnostic purposes. Refer to her paper for a discussion of these details.

Female epigynum.—A thorough study of the homologies of the structures of the female genitalia is beyond the scope of the present analysis and the terminology used here is adapted from the work of Sierwald (1989) on American pisaurid genera. Emphasis is here directed to identification of major components and unique features of the genitalia of only *Trechalea* for diagnostic purposes. A preliminary survey of various trechaleid genera reveals a considerable range of variation, and each one will be treated individually later. Thus, broad generalizations concerning the family or any assortment of genera within it are left to work in progress. For descriptive purposes, terms are coined for use in *Trechalea* and may or may not be applicable to other members of the family.

The epigynum is generally heavily sclerotized (*T. trinidadensis* excepted), dark and opaque, with some components fused together, which makes detailed observation difficult without initial clearing. The external *epigynal plate* (*ep*) (Fig. 8) is composed of four regional elements, two *lateral lobes* (*ll*) which comprise the elevated portions on either side, an *anterior field* (*af*) which occupies most of the anterior half of the epigynum and is usually continuous with, but not always distinct from, the lateral lobes. The *middle field* (*mf*) is a distinct, posterior, median component set off from the other components by furrows and/or the *posterior margin of anterior field* (*pma*). (The “external, outer lateral margin of the epigynal fold” described by Sierwald (1989) for pisaurids appears in trechaleids to be round-

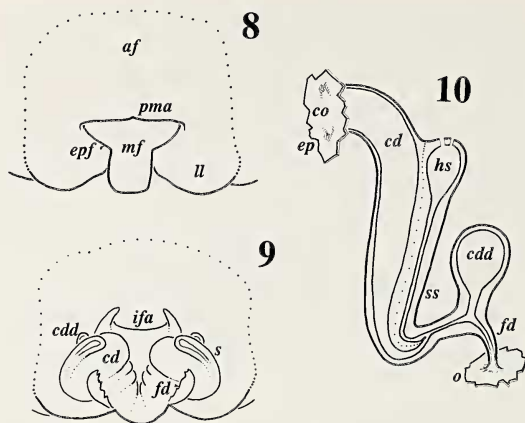
ed, less distinct and to lie out of sight under [dorsad to] the *mf*.) The relative shapes and dimensions of these components tend to be species-specific and are illustrated.

Internally (Figs. 9, 10), on each side, a generally large, voluminous *copulatory duct* (*cd*) arises from the anterior portion of the *epigynal fold* (*epf*) at the *copulatory opening* (*co*) and curves inward and posteriorly where it gives rise to a *spermathecum* (*s*) composed of a terminal enlargement (*head of spermatheca*, *hs*) at the end of a stalk (*stalk of spermatheca*, *ss*), most of which lies fused against the copulatory duct. A second diverticulum, called the *copulatory duct diverticulum* (*cdd*) arises secondarily from the copulatory duct. Although the function of this structure is unknown, its presence has been noted by Griswold (1993; "lobate spermathecal base", character #39). My interpretation of its relative position (between *ss* and *fd*), however, departs from his. I have been unable to find this structure in all trechaleids, except, e. g., a species of *Dossenus*. A *fertilization duct* (*fd*) continues from this junction to meet the *oviduct* (*o*) on its ventral side. An *internal fold of the anterior field* (*ifa*) in the shape of a thin flap (called "wing" by Sierwald) occurs in various shapes and is most conspicuous laterally where it joins the *cd*.

CRITICAL REVIEW OF SOME TAXONOMIC CHARACTERS USED IN RELATED FAMILIES

Since I reintroduced the family Trechaleidae (Carico 1986), it has been the independent opinion of Sierwald (1989, 1990), and Griswold (1993), that the Trechaleidae (or the "*Trechalea* genus-group") deserves family status and has as its nearest relatives the families Pisauridae and Lycosidae, with Lycosidae the closer. Coddington & Levi (1991) adopted the conclusions of Griswold and used the family name Trechaleidae. Additionally, Dondale (1986) emphasized in *Trechalea* its unique and lycosid-like features in his description of the subfamilies of the Lycosidae.

The Pisauridae, as currently constituted, appears to be a very complex group and may not be monophyletic. Sierwald, in her excellent studies of the American pisaurid female copulatory organs (1989) and male palpal organs (1990), stated that the known genera are apparently polyphyletic, a conclusion with which I agree. In contrast, however, monophyly was assumed for Lycosidae by Dondale (1986), who proposed a group



Figures 8–10.—*Trechalea* epigynum anatomy based on *T. longitarsis*: 8, epigynal plate, ventral view; 9, internal structures, dorsal view; 10, diagram of relative positions of internal structures. Abbreviations in methods section.

of synapomorphies for that family and proceeded further to define a number of subfamilies.

Griswold (1993) presented a wide-ranging but preliminary analysis of the Lycosoidea and included as exemplars in his cladogram members of the Pisauridae (*Dolomedes tenebrosus* Hentz, *Pisaura mirabilis* (Clerck)), Lycosidae (*Lycosa helluo* Walck., *Sosippus placidus* Brady), and the Trechaleidae (*Trechalea* sp.). The controversial genus *Rhoicinus* (Rhoicininae), considered a possible trechaleid by Sierwald (1990), was included. In his cladogram, a total of 20 apomorphies emerged to distinguish the six exemplars of these three families.

Both Sierwald (1990) and Griswold (1993) considered rhoicinines to be related to the trechaleids. The latter author included an undescribed *Rhoicinus* in his cladogram which emerged as a sister group to his genus *Trechalea* sp. and therein implied the two could be considered members of the Trechaleidae. Because of the problems historically in assigning a family for rhoicinines (Platnick 1979), the perceived weakness of Griswold's synapomorphies (discussed below), and the diversity of characters among the various genera currently assigned to the group (Exline 1960), I do not include rhoicinines in the Trechaleidae. However, I do not exclude the possibility of the family being broadened later to include rhoicinines as well as other genera, e. g., *Shinobius* of Yaginuma (1991).

In any case, the conclusions here must be considered provisional pending the outcome of on-

going studies by various workers who are continuing to revise the genera within these families. Such work is required to reveal consistent characters which contribute to greater confidence in whatever conclusion is reached about systematic relationships. Therefore, no cladistic analysis is offered here.

Following is a discussion of the taxonomic characters used to distinguish the families Trechaleidae relative to Pisauridae and Lycosidae used by recent workers (Dondale 1986; Sierwald 1989, 1990; Griswold 1993) including some offered here for the first time.

PLE situated behind PME to form a third row of eyes.—This character is a traditional one used to separate lycosids from the pisaurids. It is mentioned by Dondale (1986) and Sierwald (1990), and Griswold (1993).

Retrolateral apophysis on the male palpal tibia.—This is also a long-standing character used to separate pisaurids and lycosids and is mentioned by Dondale (1986), Sierwald (1990) and Griswold (1993). Separately, Dondale (1986) assumed that the loss of a retrolateral apophysis in the lycosids is a derived state. It is present in Trechaleidae and Pisauridae.

Median apophysis position on bulb.—This character is offered here for the first time and refers to the position of the median apophysis on the palpal bulb as viewed from the ventral side. The position is either somewhere on the ventral face, e. g., Lycosidae and Pisauridae, or, in the case of trechaleids, enlarged and occupying the distal fourth or third portion of the bulb mass.

Folded ventrodiscal rim of the male tibia.—This is a reinterpretation of a so-called “pit” located ventrally at the apical end of male palpal tibia reported by others. Attention to a pit perhaps began with a feature noted in *Rhoicinus* by Exline (1960) who described it as an “unsclerotized pit, surrounded by a fairly high, rebordered, chitinous ring.” A “membranous pit that accompanies the tibial apophysis” was noted later by Sierwald (1990) also in *Trechalea*, and she proposed that this may be synapomorphic for the two genera. Recently Yaginuma (1991, pp. 2, 4) noted a similar feature in a Japanese spider *Shinobius orientalis* (Yaginuma) and thus assigned this spider to the Rhoiciniinae in the Pisauridae with reservation. Griswold (1993) used a similar character in his analysis of lycosoids and named it as, “Male palpal tibia with retroapical cuticle unsclerotized.” He used this as an important character to link both *Rhoicinus* and

Trechalea together in his cladogram with the implication that the former genus was a trechaleid.

An examination of *Rhoicinus*, however, reveals that there is indeed a “ring” present, but the cuticle enclosed is actually sclerotized and the whole structure is situated on the sclerotized portion of the tibia. This ring and its enclosed cuticle are not synonymous with the “membranous pit” in the trechaleids as reported by these latter workers and is actually homologous with the retrolateral apophysis (*rt*) of trechaleids and pisaurids.

In the Trechaleidae (as here defined), another type of pit (not found in *Rhoicinus*) is actually formed from the *ventral cymbio-tibial membrane* (*vcm*, Fig. 7) of the male palpal tibia. This membrane, found in all spiders, may be broad and flexible to permit a wide arc of flexion at the articulation between the cymbium and tibia. It is not uncommon to note a concavity of varying degrees in this soft membrane in spiders of all three families. Since this concavity results from varying conditions of preservation, it is thus not taxonomically significant. The pit of *Trechalea* referred to by the previously-mentioned authors, however, is due less to a condition of the membrane itself, but rather to the morphology of the adjoining sclerotized *ventrodiscal rim* (*vr*) (Fig. 7) of the tibia. In the trechaleids and, to a lesser degree, the pisaurids, there is a folding back downward of the rim into the inside of the cylindrical tibia, forming a noticeable depression in the ventral and retroventral end of the tibia because the *vcm* typically arises from this deep recess. In these same two families, the rim is usually also molded into a *ventrodiscal protuberance* (*vp*) and thus forms a characteristic shape to the tibial rim from ventral view. No such rim or protuberance is found in American lycosids. What makes the so-called pit more noticeable in the trechaleids is that the distal, gaping opening of the cylindrical tibia is larger, and the dorsoventral elongation is accentuated by the *vp*.

Method of egg sac transport.—I depart from other workers in the interpretation and use of this character. The traditional approach has been to state the choice between “carrying egg sac in chelicerae” or “carrying egg sac on spinnerets”. This is similar to Griswold’s (1993) character #68 and is mentioned by Sierwald (1990) and Dondale (1986). This seems an oversimplification and inaccuracy because in all three families the females carry the egg sac attached to the spinnerets. Therefore, the pisaurids, which alone em-

ploy the chelicerae in transport of the egg sac, also carry it simultaneously with the spinnerets; this important fact is often overlooked. There are examples of carrying the egg sac in the chelicerae only in such diverse families as Pholcidae (Kaston 1948, p. 67) and Synotaxidae (*Mangua gunni* Forster et al. 1990, p. 76) and thus is not equivalent to the case with pisaurids.

Egg sac transport by spinnerets alone is commonly associated with lycosids but is also reported in trechaleids (Simon 1898a, *Trechalea*, *Hesydrus*, etc.; Van Berkum 1982, *Trechalea extensa*; Carico et al. 1985, *Trechalea amazonica*; Carico pers. obs., *Trechalea extensa*, *T. gertschi*, *Hesydrus habilis*).

Therefore use of the spinnerets to carry the egg sac is apparently plesiomorphic for all three families. The apomorphy customarily stated as "egg sac transported in chelicerae" in the context of the current discussion is more accurately restated by combining the two attachments, as is the case in the pisaurids.

Structure of egg sac seam.—It is assumed that during the construction of the egg sac in all three families, a seam is made because of the typical sequence of egg laying, i. e., lower sheet construction, followed by egg mass deposition and upper sheet construction. Specifically considered here, however, is the seam appearance when the egg sac is full of eggs (not hatchlings) after construction is complete. The appearances differ in all three families: seam apparent on spherical egg sac without "skirt" (lycosids), seam apparent as a rim on discoid egg sac with a "skirt" (trechaleids) (Fig. 6), seam not apparent on spherical egg sac (pisaurids).

Method of maternal care of young after emergence from egg sac.—Some form of maternal care is characteristic of all three families, but each family has a distinct method of caring for young. Trechaleids transport young on an empty egg sac. The young congregate on the empty egg sac which the female continues to carry until after the young disperse. However, as has been noted by Carico et al. (1985), transport of young on the abdomen has been observed in the trechaleids. Caution must be used in applying this character to the trechaleids because, in my observations, the presence of some spiderlings on the mother's abdomen seems only to occur when they are crowded and pushed off the egg sac. Therefore, young on the abdomen of trechaleids appears incidental and not synonymous with young transport on the abdomen in lycosids. Transport of young on

the mother's abdomen is a character which is typically associated with lycosids, and in Dondale's (1986) list it is associated with transport of the egg sac on the spinnerets. It is important to note that Yaginuma (1991) reported that three Japanese lycosids, as well as his rhoicinine, *Shinobius*, carry the young on the egg sac. The nursery web is one of the most traditional characters of the family Pisauridae and has promoted the term "nursery-web spiders" for this group. This is mentioned by Carico (1973) and Sierwald (1990). It is Griswold's (1993) character #67.

Binding of female's front two pairs of legs by male during copulation.—Use of a bridal veil of silk by the male during copulation is widespread though apparently uncommon in spiders (Schmitt 1992). In the families here under consideration, only the pisaurids *Pisaurina mira* (Bruce & Carico 1988), *Ancylometes bogotensis* (Merrett 1988), and *Dolomedes triton* (Wojcicki 1990) are reported to use this behavior. In these three genera a unique type of veil is used, which has the structure spun only over the first two pairs of legs.

Web retreat.—Trechaleids are not known to build webs or retreats of any kind. Some lycosids are known to build webs with tubular retreats (Brady 1962). A distinctive structure of the pisaurid retreat, when present, is the characteristic short tube with the openings distinctively flared that has been found in another disparate group of pisaurid genera: *Pisaura mirabilis* (Lenler-Erikson 1969), *Pisaurina mira* (Carico 1985), and *Architis nitidopilosa* (Nentwig 1985). This retreat may be found only as a juvenile web in *P. mirabilis* and *P. mira* or as a more extensive web in the adult *A. nitidopilosa*. The spider rests with its body at right angles to the axis of the tube with its legs resting in the flared openings.

Reattachment of egg sac.—Female lycosids and pisaurids are well-known to reattach the egg sac if it is dislodged. In the trechaleids I have observed, *Trechalea gertschi*, *T. extensa*, and *Hesydrus habilis*, the egg sacs were never reattached to the spinnerets. On examination of upper surfaces of several egg sacs of these and other species, only a single, conspicuous attachment disc is ever present, although a zig-zag pattern of these "carrying threads" across the surface may be produced before final attachment.

Additional characters.—In Griswold's (1993) extensive character set, 14 additional new morphological synapomorphies were utilized in his cladistic analysis to distinguish these three families from each other and from the other families

of the Lycosoidea. Because their use has been applied only to the six exemplars and their universalities have not been tested in other genera of these families, they are not discussed further in the present study.

Sierwald (1990) referred to the “small, reduced conductor” (p. 51) as a synapomorphy for the “*Trechalea* genus-group”. Because this structure in pisaurids ranges in size from the “large and strongly sclerotized. . . conductor in *Tinus*. . .” to “a low hump or prominence, as the conductor in *Architis*. . .” (p. 18) it is a difficult character to use. Her observation of “a median apophysis with two branches. . .” in this genus-group (p. 50) is difficult to apply because the median apophyses of some trechaleids have more than two while many lycosids have two branches, although they may not be of the same form as in trechaleids. She also observed that the “sperm duct with several switchbacks. . .” (p. 50) is a synapomorphy. If a switchback is defined as loop wherein the tube reverses its direction, then it is present in *Trechalea* and some other larger trechaleids, but smaller trechaleids such as *Dyrines* (p. 35) have only one or none in an undescribed genus. There are a number of undulations of the sperm duct which are also found in *Staberius*, a pisaurid (1990, fig. 25) and some local lycosids.

Genus *Trechalea* Thorell

Triclaria C. L. Koch, 1848:101, (type species by original designation, *Triclaria longitarsis* C. L. Koch).

Trechalea Thorell, 1869:37, (*nomen novum* for *Triclaria*, preoccupied). Simon, 1898a:279–281, 304–312, 315. Roewer, 1954, 2a:142. Bonnet, 1955–1959, II:4678. Lehtinen, 1967:379 (genus *incertae sedis*). Brignoli, 1983:461. Platnick, 1989:398.

Perissoblemma O. Pick.-Cambridge, 1881:773. First synonymized by Simon 1898a:311.

Diagnosis.—*Trechalea* can be distinguished from *Syntrechalea* by the fewer number of ventral tibial macrosetae pairs (4–6) while the latter has about twice as many. Also, *Trechalea* can be distinguished from *Hesydrus*, its closest relative, by having only the tarsi flexible while the latter genus has also the metatarsi flexible. The middle field of the epigynum in *Trechalea* is relatively short and lobe-like while that of *Hesydrus* tends to be longer and scape-like.

Description.—Carapace moderately low, cephalic area relatively distinct, AE row straight or slightly recurved when seen from above. Retro-marginal cheliceral teeth ranging from 3–5, variable in size and distance. Leg relative lengths

variable but III always shortest and IV almost always longest, only tarsi flexible, scopula may be present on metatarsus and tarsus, all claws dentate, pairs of macrosetae on ventral side of tibia I ranging from 4–6.

Male palpal bulb median apophysis with acute, conspicuous guide, ventral division variable but thickened, tibial retrolateral apophysis divided with ental division distinct, often lobed and partly surrounded by ventral cymbio-tibial membrane, ectal division conspicuous and in various forms.

Female epigynal plate with middle field about as wide as long or only slightly longer than wide, usually widest anteriorly (Fig. 8).

Distribution.—Found from the Gila River drainage system of central Arizona, United States southward to the state of Rio Grande do Sul, Brazil.

Natural history.—Most members of this genus are found on the margins of freshwater streams and lakes. Many species are restricted to a particular river drainage system.

Disposition of nominal species of *Trechalea*.—*Trechalea ornata* Mello-Leitão (1943), *Trechalea wygodzinski* Soares and Carmargo (1948), *Trechalea keyserlingi* F. Pickard-Cambridge (1903), and *Trechalea biocellata* Mello-Leitão (1926) are being transferred to new trechaleid genera.

Trechalea reimoseri Caporiacco (1947) is represented by two syntypes, neither of which is a *Trechalea*, each belonging to different genus. The female is a *Syntrechalea* and the male is in an undescribed trechaleid genus. *Trechalea protenta* Karsch (1879) is transferred to *Paradossenus*. *Trechalea thomisiformis* (O. Pickard-Cambridge, 1881) is a very small juvenile lycosoid and appears not to be a trechaleid, but of doubtful genus. *Trechalea monticola* Chamberlin (1916) is transferred to *Hesydrus*.

Unsuccessful efforts were made to obtain certain holotypes of various species described by Mello-Leitão. The provisional determination of their status is made as follows: both *Trechalea syntrechaloides* Mello-Leitão (1940b, type #41476) and *T. limai* Mello-Leitão (1940b) appear from drawings and descriptions to belong to a new unnamed trechaleid genus. *T. aurantia* Mello-Leitão (1942) may be a *Hesydrus*. The generic status of *T. numida* Mello-Leitão (1943) and *T. langei* Mello-Leitão (1947) cannot be determined from their descriptions.

Note.—While working on the genus *Hesydrus*,

Table 1.—Eye measurements for species of *Trechalea*. Measurements are dimensions with outer limits of entities included. AE row = width of anterior eye row, PE row = width of posterior eye row, OQA = width of ocular quadrangle anteriorly or width of anterior median eyes, OQP = width of ocular quadrangle posteriorly or width of posterior median eyes, OQH = height of ocular quadrangle or height of anterior median eye and posterior median eye, PLE = diameter of posterior lateral eye, PME = diameter of posterior median eye, ALE = diameter of anterior lateral eye, AME = diameter of anterior median eye, PLE-PME = interdistance between posterior lateral eye and posterior median eye, PME-PME = interdistance between posterior median eyes, ALE-AME = interdistance between anterior lateral eye and anterior median eye, AME-AME = interdistance between anterior median eyes. lon = *T. longitarsis*, cez = *T. cezariana*, ama = *T. amazonica*, pau = *T. paucispina*, con = *T. connexa*, ext = *T. extensa*, ger = *T. gertschi*, mac = *T. macconnelli*, bol = *T. boliviensis*, lom = *T. lomalinda*, tri = *T. trinidadensis*. Measurements in millimeters.

Species/ sex	AE row	PE row	OQA	OQP	OQH	PLE	PME	ALE	AME	PLE- PME	PME- PME	ALE- AME	AME- AME
lon♂	1.88	3.56	1.08	1.78	1.70	0.76	0.74	0.32	0.49	0.58	0.27	0.15	0.25
lon♀	1.94	3.70	1.14	1.84	1.70	0.80	0.77	0.26	0.30	0.70	0.40	0.10	0.27
cez♂	1.99	3.70	1.16	1.78	1.60	0.88	0.76	0.32	0.51	0.67	0.35	0.12	0.27
cez♀	2.10	4.08	1.25	1.89	1.75	0.90	0.82	0.34	0.55	0.74	0.40	0.13	0.29
mac♂	2.08	3.78	1.22	1.88	1.80	0.86	0.80	0.35	0.60	0.62	0.41	0.14	0.28
mac♀	2.00	3.70	1.19	1.85	1.78	0.85	0.82	0.30	0.53	0.68	0.40	0.15	0.25
pau♂	1.79	3.29	1.09	1.60	1.48	0.70	0.70	0.29	0.49	0.56	0.40	0.10	0.23
pau♀	1.90	3.45	1.14	1.65	1.52	0.75	0.70	0.31	0.49	0.63	0.40	0.09	0.25
con♂	1.40	2.58	0.83	1.25	1.11	0.56	0.50	0.22	0.34	0.45	0.30	0.07	0.22
con♀	1.55	2.88	0.91	1.38	1.26	0.58	0.60	0.26	0.38	0.60	0.28	0.08	0.25
ext♂	1.71	3.25	1.01	1.61	1.42	0.78	0.70	0.28	0.40	0.50	0.32	0.10	0.23
ext♀	1.70	3.26	1.02	1.60	1.44	0.74	0.68	0.30	0.44	0.55	0.36	0.10	0.20
ger♂	1.48	2.80	0.85	1.32	1.15	0.55	0.50	0.25	0.34	0.52	0.30	0.09	0.21
ger♀	1.61	2.98	0.96	1.40	1.25	0.65	0.50	0.25	0.40	0.58	0.33	0.10	0.25
ama♂	1.35	2.45	0.83	1.27	1.10	0.55	0.50	0.19	0.33	0.43	0.30	0.10	0.19
ama♀	1.45	2.70	0.90	1.38	1.20	0.60	0.55	0.20	0.35	0.40	0.30	0.09	0.18
bol♂	1.07	2.13	0.57	1.15	0.94	0.47	0.48	0.18	0.23	0.32	0.27	0.08	0.16
bol♀	1.05	2.18	0.58	1.15	0.96	0.50	0.47	0.18	0.23	0.37	0.27	0.07	0.16
lom♂	1.27	2.44	0.72	1.27	1.12	0.55	0.54	0.20	0.28	0.38	0.30	0.10	0.23
lom♀	1.30	2.58	0.72	1.33	1.16	0.57	0.57	0.21	0.30	0.42	0.31	0.05	0.20
tri♀	1.03	2.05	0.65	1.05	0.91	0.45	0.45	0.16	0.27	0.37	0.22	0.05	0.15

I was impressed with its similarity with *Trechalea* and hold to the possibility that later the two genera may be found to be congeneric. Currently, however, because of lack of sufficient males in *Hesydrus*, I will keep them as separate genera with the main distinction based on the flexible tarsi (i. e., flexible metatarsi only in *Hesydrus*) mentioned in the diagnosis above.

Trechalea longitarsis (C. L. Koch)

Figures 7, 11–15, 25; Map 1

Triclaria longitarsis C. L. Koch, 1848:65. (Holotype is a female from Colombia deposited in the Museum für Naturkunde der Humbolt-Universität, presumed lost. The Specimen #ZMB 2006, listed as the holotype, is misidentified and is not the original type specified by Koch [see discussion above]. A neotype male is hereby designated from Quebrada Docordo, ab. 110 km N of Palestina, Rio San Juan, Choco,

Colombia, collected 20–25 January 1971 by B. Malkin and P. Burchard, deposited in the Field Museum of Natural History)

Trechalea longitarsis, Karsch, 1879:450. Roewer, 1954: 143. Bonnet, 1955-1959:4679.

Trechalea urinator Simon, 1898b:20. (Male and female syntypes from Guayaquil, Depto. Loja, Ecuador in the Muséum National d'Histoire Naturelle, examined.) Roewer, 1954:143; Bonnet, 1955–1959:4679. NEW SYNONYMY.

Diagnosis.—This is the only species of *Trechalea* with four retromarginal cheliceral teeth. Both sexes are also distinguished by the details of the genitalia. The median apophysis of the palpal bulb bears a distinct tubercle between the guide and ventral division (Figs. 11, 15), a feature shared only with *T. extensa* (Figs. 20, 53). *T. longitarsis* differs from the latter species by the

Table 2.—Leg measurements in male of *Trechalea longitarsis*.

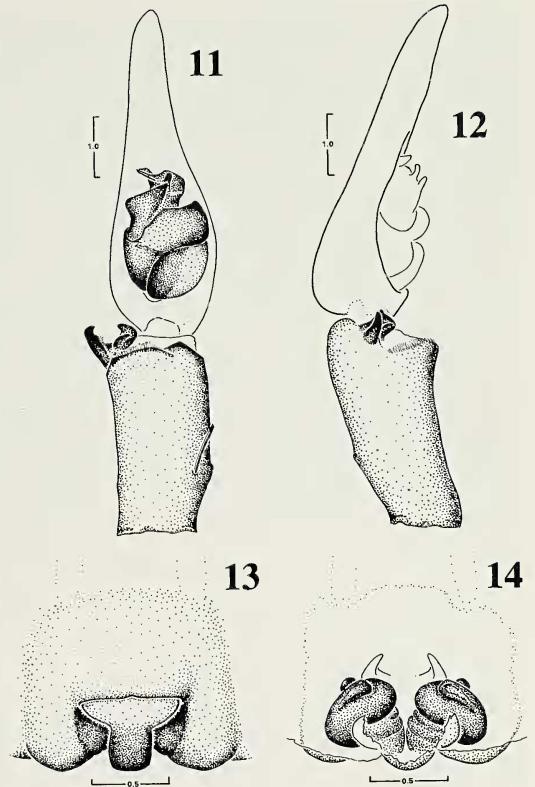
Leg segment	I	II	III	IV
Femur	18.5	21.2	16.0	21.0
Tibia-patella	25.2	26.6	20.0	25.4
Metatarsus	19.0	21.5	16.6	24.8
Tarsus	12.2	13.9	11.0	15.5
Total	74.9	83.2	63.6	86.7

length of the cymbium which is about twice the length of the bulb (Fig. 11).

Description.—*Male*: (Río San Juan, Depto. Choco, Colombia). Carapace low, cephalic area not elevated, length 11.1, width 9.5, medium brown with submarginal bands distinct posteriorly, less so anteriorly, dark at lateral margins and in eye region. Sternum light, unmarked, length 5.2, width 5.1; labium dark brown, lighter at distal margin, length 2.2, width 2.0. Clypeus height 1.36, width 5.0. Anterior eye row straight, a cluster of bristles posterior to each PLE, eye measurements in Table 1. Chelicerae face dark, clothed with light hairs mostly in proximal two-thirds, an oblique groove above fang and a longitudinal carina laterally on distal two-thirds, four retromarginal teeth equidistant, subequal in size except distal one slightly smaller. Legs IV-II-I-III, measurements in Table 2, ventral macrosetae pairs on tibiae are I-5, II-5, III-5, IV-5. Color of legs medium brown, unmarked. Abdomen length 9.5, hairy above, dark above and without distinct pattern except for reticulated and striated distribution of pigment, light ventrally.

Palpus (Figs. 11, 12), median apophysis (Fig. 15) with *ma* guide winged apically, and with a distinct distal tubercle situated between the dorsal and ventral subdivisions; cymbium length/palpal bulb length ratio 2.14. Tibial apophysis (Fig. 25) with *ecd* flattened and hooked distally and serrated along inner margin.

Female: (Río San Juan, Depto. Choco, Colombia). Carapace shape and color as in male, length 9.9, width 9.0. Sternum light, unmarked, length 5.8, width 5.2; labium color as in male, length 2.00, width 1.96. Clypeus height 1.41, width 5.15. Anterior eye row straight, eye measurements in Table 1. Chelicerae color and hair as in male. Legs IV-II-I-III, measurements in Table 3; ventral macrosetae pairs on tibiae I-5, II-4, III-4, IV-3. Color of legs as in male. Abdomen length 8.8, hairy above, color as in male except for indistinct pairs of light spots. Epigynum (Figs. 13,



Figures 11–14.—Genitalia of *Trechalea longitarsis* (Choco, Colombia): 11, 12, right palpus; 11, ventral view; 12, retrolateral view; 13, 14, epigynum; 13, ventral view; 14, dorsal view. Scales in mm.

14) with the lateral margins *mf* almost parallel; *s* mostly fused to *cd*.

Variation.—The average carapace length of eight males is 11.24 (range 10.8–11.8), and the average carapace length of nine females is 10.31 (range 9.5–11.0). The average cymbium/palpal bulb length ratio is 1.96 (range 1.81–2.19, $n = 8$).

Natural history.—Four egg sacs were found in three collections dated January, June, and October with an average diameter of 16.8 (range 15.0–19.8). All egg sacs were typically disc-shaped with both the top and bottom valves opaque and brown-colored. Two egg sacs were still attached to the spinnerets by threads. Apparently the principal habitat is around streams because most collection records refer to a river while one collection note stated explicitly, “near water”. Another collection note stated, “en la selva”.

Distribution.—From northern Peru northward to northern Colombia along the eastern river

Table 3.—Leg measurements in female of *Trechalea longitarsis*.

Leg segment	I	II	III	IV
Femur	18.3	20.5	16.0	20.6
Tibia-patella	23.2	25.6	18.5	23.6
Metatarsus	18.6	21.1	17.1	24.6
Tarsus	12.8	13.0	10.8	15.9
Total	72.9	80.2	62.4	84.7

drainages. There are no records of collections from the Amazon or Orinoco basins. (Map 1).

Specimens examined.—**COLOMBIA:** *Choco:* Quebrada Dorcordero, 110 km N of Palestina, Río San Juan, 20–25 Jan. 1971 (B. Malkin & P. Burchard), 5♂ 3♀ 5 juv. (FMNH); *Pangola,* 40 km N of Palestina, Río San Juan, 14–18 Jan. 1971 (B. Malkin & P. Burchard), 2♀, 6 juv. (FMNH); *Cauca:* Quebrada, Huangui, Río Saija area, 100 m (B. Malkin), 1♂ 2♀ 6 juv. (FMNH); *Magdalena:* Serr. Nueva Granada, Sierra Nevada de Santa Marta, 24 April 1975 (J. A. Kochalka), 1♂ 1♀ (JAK); *Santander:* Río Suarez, 800–1000 m, 11–17 Aug. 1946 (collector unknown), 2♂ 2 juv. (AMNH). **ECUADOR:** *Pichincha:* 12 km SW of Santo Domingo de los Colorados, 4–8 April 1971 (B. Malkin), 2♀ (FMNH); *El Oro:* Río Colorado Pasáje, 4 Nov. 1942 (Walls), 1 juv. (EXPE); *Imbabura:* Lita, Sept. 1984 (D. Bastidos), 1♂ (MECN); *Cañar:* Yanayacu, 22 Sept. 1984 (R. Navarrette), 1♀ (MECN). **PERU:** *Piura:* Caña Dulce, Oct. 1943 (C. & E. Ewing), 1♂ (CAS).

Trechalea cezariana Mello-Leitão
Figures 16, 26, 35–38; Map 1

Trechalea cezariana, Mello-Leitão, 1931:12, fig. 2 (The holotype is a female from Río Cruz, near Gramado, Municipio de Taquara, Est. Río Grando do Sul, Brazil, collected by Cezar Pinto, deposited in the Museo Nacional, Río de Janeiro, Brazil, examined.) Roewer, 1954:142; Bonnet, 1955–1959:4678.

Diagnosis.—The median apophysis of the palpus is notched anteriorly (Fig. 16) and the ectal division of the tibial apophysis is small, flat and curved (Fig. 26). The epigynum is characterized by the very wide and flattened middle field with a median groove (Fig. 37).

Description.—*Male:* (Lassance, Minas Gerais, Brazil). Carapace low, length 9.65, width 9.35, no distinct pattern, dark in eye region, a pair of small depressions with dark hairs anterior to thoracic groove; sternum light, unmarked, length 5.0, width 4.6; labium dark reddish brown, light distally, length 2.25, width 1.75. Clypeus height 1.14, width 4.25. Anterior eye row straight, eye measurements in Table 1. Chelicerae dark red-



Map 1.—Distribution of species of *Trechalea* in South America. ● = *T. macconnelli*, ■ = *T. paucispina*, ◆ = *T. cezariana*, ▲ = *T. longitarsis*. Dashed lines indicate major river drainage basins and/or continental divides.

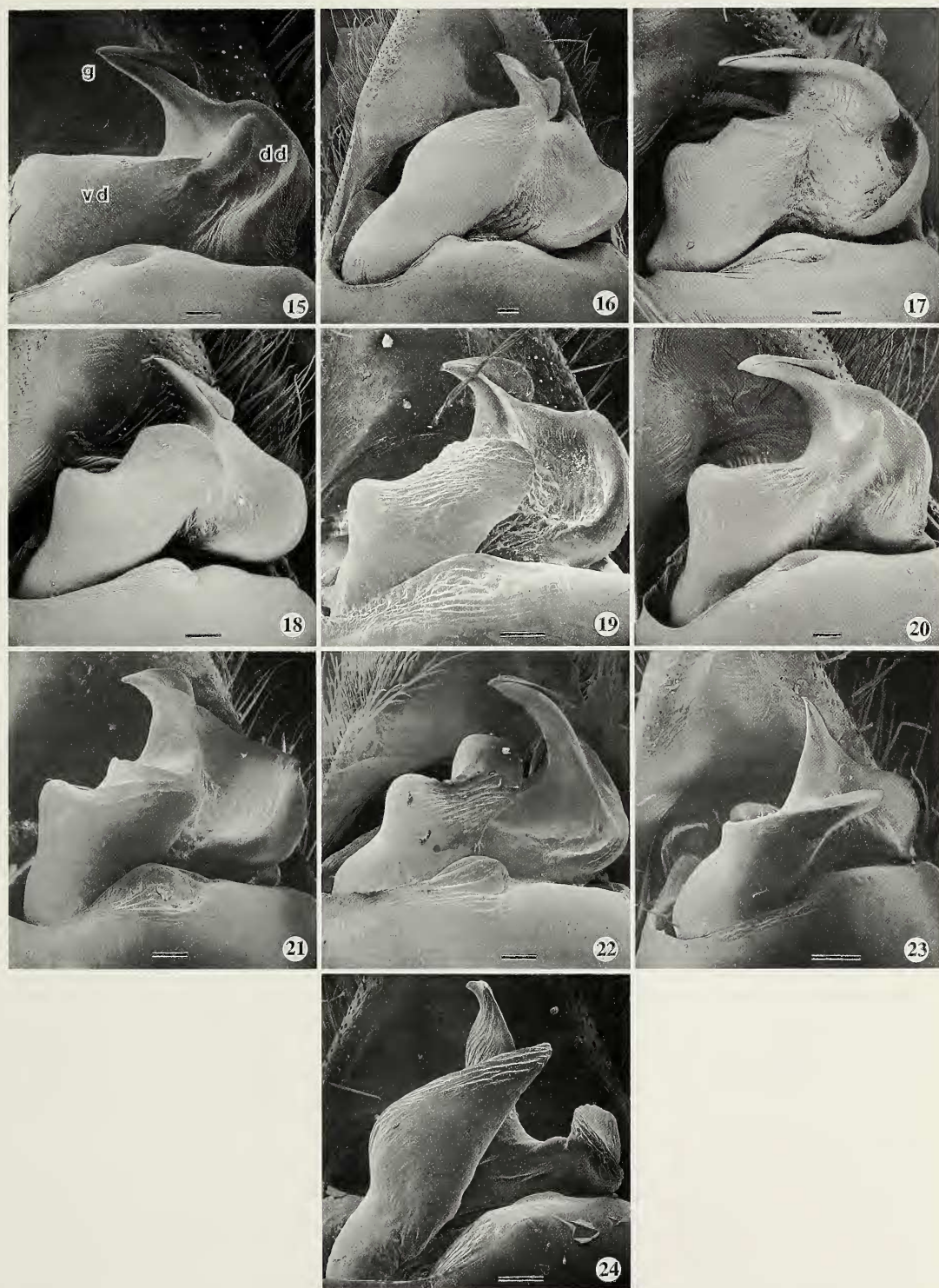
dish brown, clothed with setae on anterior surface, oblique depression above fang, a longitudinal carina along distal third of anterolateral margin, three retromarginal teeth of equal size with gap between proximal two. Legs IV-II-I-III, light and unmarked, measurements in Table 4, ventral tibial spine pairs I-5, II-5, III-3, IV-4. Abdomen length, 8.0, marked with indistinct pattern above, light ventrally.

Palpus (Figs. 35, 36), *ma* (Fig. 16) notched, *rta* (Fig. 26) with *end* thickened and rounded, *ecd* small, thickened but acute distally and directed mediad.

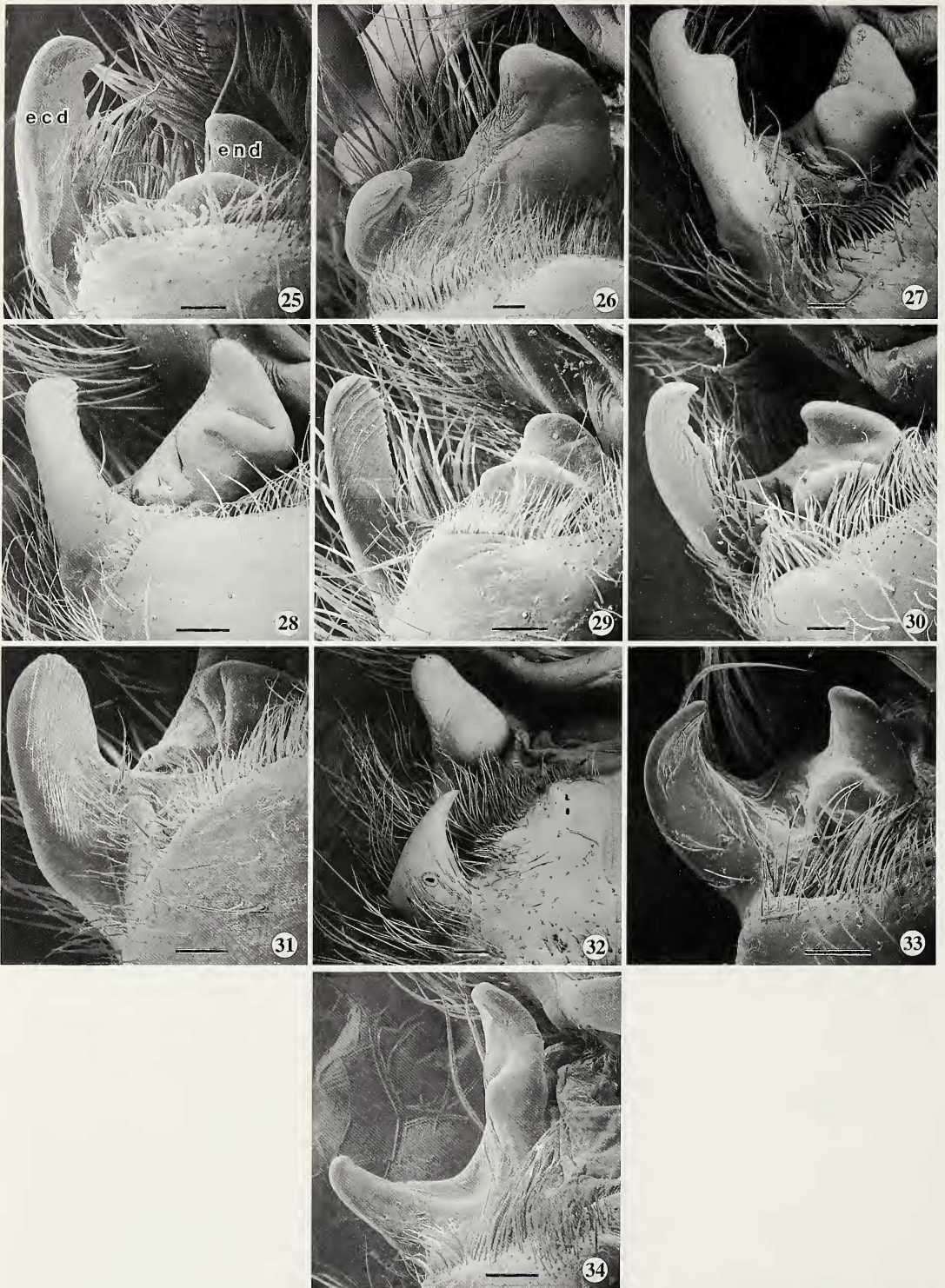
Female: (Lassance, Brazil). Carapace low, length 9.6, width 9.8 marked as in male; sternum

Table 4.—Leg measurements in male of *Trechalea cezariana*.

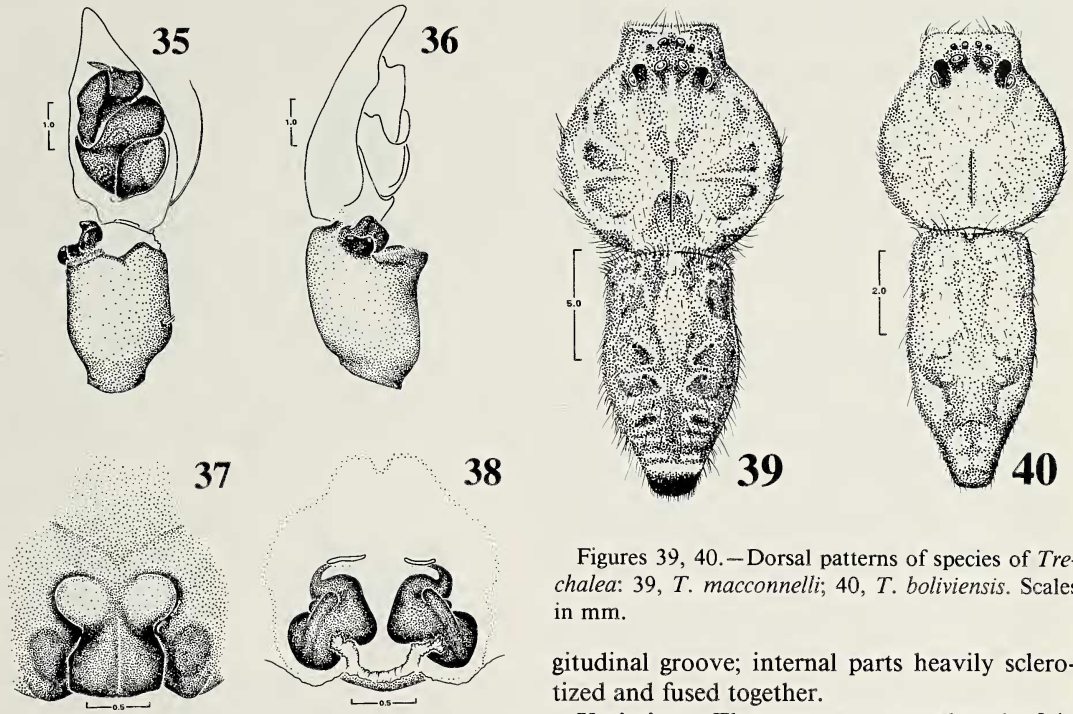
Leg segment	I	II	III	IV
Femur	14.1	16.6	13.8	16.4
Tibia-patella	19.3	22.0	16.6	20.3
Metatarsus	14.8	17.3	13.2	19.4
Tarsus	8.8	9.3	7.8	11.0
Total	57.0	65.2	51.4	67.1



Figures 15–24.—Scanning electron micrographs of median apophyses from right palps of species of *Trechalea*, ventral views; 15, *T. longitarsis* (dd = dorsal division, g = guide, vd = ventral division); 16, *T. cezariana*; 17, *T. macconnelli*; 18, *T. paucispina*; 19, *T. connexa*; 20, *T. extensa*; 21, *T. gertschi*; 22, *T. amazonica*; 23, *T. boliviensis*; 24, *T. lomalinda*. Scales: 100 μ .



Figures 25–34.—Scanning electron micrographs of retrolateral tibial apophyses from right palps of species of *Trechalea*, ventral views: 25, *T. longitarsis* (ecd = ectal division, end = ental division); 26, *T. cezariana*; 27, *T. macconnelli*; 28, *T. paucispina*; 29, *T. connexa*; 30, *T. extensa*; 31, *T. gertschi*; 32, *T. amazonica*; 33, *T. boliviensis*; 34, *T. lomalinda*. Scales: 100 μ .



Figures 35–38.—Genitalia of *Trechalea cezariana* (Minas Gerais, Brazil): 35, 36, right palpus; 35, ventral view; 36, retrolateral view; 37, 38, epigynum; 37, ventral view; 38, dorsal view. Scales in mm.

light, unmarked, length 5.15, width 4.9; labium color as in male, length 1.35, width 1.8. Clypeus height 1.20, width 4.78. Anterior eye row straight, eye measurements in Table 1. Chelicerae as in male but without oblique depression, cheliceral teeth as in male. Legs IV-II-I-III, measurements in Table 5, light, unmarked ventrally but with faint oblique lateral gray maculae, pairs of macrosetae on venter of tibia I-4, II-4, III-4, IV-4. Abdomen length 12.25, marked with indistinct pattern above, light ventrally.

Epigynum (Figs. 37, 38) heavily sclerotized and dark, *mf* very wide, flattened with a median lon-

Figures 39, 40.—Dorsal patterns of species of *Trechalea*: 39, *T. macconnelli*; 40, *T. boliviensis*. Scales in mm.

gitudinal groove; internal parts heavily sclerotized and fused together.

Variation.—The average carapace length of six males is 10.02 (range 8.3–11.0) and the average carapace length of seven females is 9.66 (range 8.1–10.3).

Natural history.—None of the collection records provide information about the type of habitat. Two quite flat egg sacs of typical construction were found with females collected 25 March and 4 October and were 19.25 and 18.5 respectively.

Distribution.—The rather sparse number of collections of this species indicate that the main area of distribution is in the various tributaries of the Río de la Plata in southern Brazil. There are additional records from the coastal areas of Brazil in the states of Río Grande do Sul and Río de Janeiro, and a single collection from the upper tributary of Río São Francisco in the state of Minas Gerais. (Map 1).

Specimens examined.—**BRAZIL:** *Minas Gerais:* São Gonçalo das Tabacas, Lassance, 25 March 1925 (D. M. Cochran), 2♂ 3♀, 3 imms. (USNM); Río de Janeiro, Thayer Expedition, 1♂ (MCZ); *Río Grande do Sul:* Reserva Biológica do Ibicuí-Mirim, Santa Maria, 4 Oct. 1989 (N. Silveira), 1♀ (MCN), Itaúba, Arroio do Tigre, 7 April 1978 (A. A. Lise), 2♂ (MCN), 11 April 1978 (H. Bischoff), 1♀ (MCN), 11 April 1978 (A. A. Lise), 1♂ 1♀ (MCN). **ARGENTINA:** *Misiones:* Parque Nacional Iguazu, Sept. 1963 (M. E. Galiano), 1♂ 1♀ (MEG). **BOLIVIA:** *Santa Cruz:* Estación el Portón, Serranía de Santiago, 24 Sept. 1955 (F. Azambuya), 1♂ (CAS).

Table 5.—Leg measurements in female of *Trechalea cezariana*.

Leg segment	I	II	III	IV
Femur	13.5	15.8	13.2	15.7
Tibia-patella	18.5	21.7	16.5	19.7
Metatarsus	13.6	16.0	13.3	18.8
Tarsus	8.3	9.3	8.0	11.2
Total	53.9	62.8	51.0	65.4

Table 6.—Leg measurements in male of *Trechalea macconnelli*.

Leg segment	I	II	III	IV
Femur	20.4	22.3	16.6	21.0
Tibia-patella	25.3	26.8	19.0	25.2
Metatarsus	19.5	21.8	16.1	24.3
Tarsus	12.5	13.6	11.2	16.0
Total	77.7	84.5	62.9	86.5

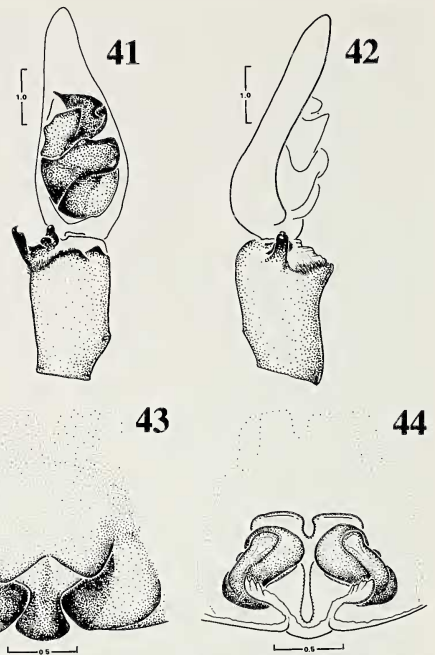
Trechalea macconnelli Pocock
 Figures 17, 27, 39, 41–44; Map 1

Trechalea macconnelli Pocock 1900:67, 68, fig. 2e (The holotype is a male from Mount Roraima [base 3500 feet] Guyana, collected by F. V. McConnell and J. J. Quelch, deposited in The Natural History Museum, London, examined). F. Pickard-Cambridge, 1903: 159, 163. Petrunkevitch, 1911:548. Roewer, 1954: 143. Bonnet 1955–1959:4679.

Trechalea ellacombei F. Pickard-Cambridge 1903:161, 162, pl. XV, fig. 6 (The holotype is a female from Bergen-Dal, Surinam, collected May 1892 by E. W. Ellacombe, deposited in The Natural History Museum, London, examined). Petrunkevitch 1911:548. Roewer 1954:142. Bonnet 1955–1959:4679. NEW SYNONYMY.

Diagnosis.—Both sexes are distinguished by the transverse band of white hairs dorsally near the posterior apex of the abdomen (Fig. 39). The males are also distinguished by the shape of the median apophysis (Fig. 17) and the hook-like configuration of the ectal division of the tibial apophysis (Fig. 27). Both sexes have a distinct black tip on the dorsal abdominal apex (Fig. 39).

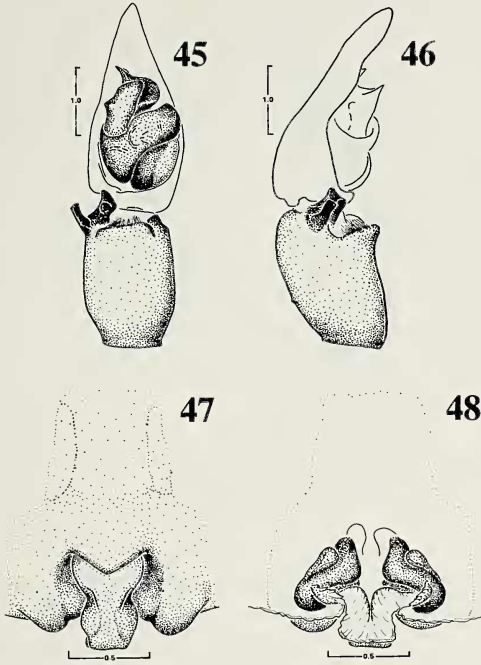
Description.—*Male:* (Cusuimi, Pastaza, Ecuador). Carapace low, cephalic area somewhat elevated, length 10.7, width 10.0, medium brown, darker at margin and black in eye region, light hairs on clypeus; sternum light, unmarked, length 5.4, width 5.2; labium dark brown, lighter distally, length 2.15, width 1.92. Clypeus height 1.20, width 3.8. Anterior eye row straight, eye measurements in Table 1. Chelicerae face dark, clothed with light hairs clustered in longitudinal patches, an oblique groove above each fang and a short longitudinal carina laterally, three retro-marginal teeth equal in size with distal two closer together. Legs IV-II-I-III, measurements in Table 6, ventral macrosetae pairs on tibiae are I-5, II-5, III-4, IV-4. Color of legs generally medium brown, lighter on ventral side of femora and without distinct pattern. Abdomen length 9.0, hairy above with reticulated pattern of dark pig-



Figures 41–44.—Genitalia of *Trechalea macconnelli*: 41, 42, right palpus (Pastaza, Ecuador); 41, ventral view; 42, retrolateral view; 43, 44, epigynum (Rondônia, Brazil); 43, ventral view; 44, dorsal view. Scales in mm.

ment except with a medium light cardiac area, a transverse light band near the posterior apex and a patch of dark hairs apically; light ventrally. Palpus (Figs. 41, 42, second male from same locality), *g* of *ma* (Fig. 17) divided into two blade-like carinae and rugose on some surfaces; *ecd* of *rta* (Fig. 27) flattened and hooked at tip.

Female: (Jamari, Rondônia, Brazil). Carapace shape as in male, light submarginal bands and radiating light lines on darker background (Fig. 39), dark around eye region, length 9.7, width 9.6; sternum light, unmarked, length 5.2, width 4.9; labium color as in male, length 2.05, width 1.80. Clypeus height 1.15, width 4.40. Anterior eye row straight, eye measurements in Table 1. Chelicerae face dark, clothed with light hairs clustered into longitudinal patches with long dark hairs between. Legs II-IV-I-III, measurements in Table 7, ventral macrosetae pairs on tibiae I-5, II-5, III-4, IV-4. Color of legs generally dark with distinct but irregular pattern particularly on pro-lateral surfaces. Abdomen length 10.8, hairy above especially laterally, bold pattern (Fig. 39) of light and dark including a transverse band of light hairs near apex, apex with a dense patch of black hairs; light ventrally. Epigynum (Figs. 43,



Figures 45–48.—Genitalia of *Trechalea paucispina* (Guyana): 45, 46, right palpus; 45, ventral view; 46, retrolateral view; 47, 48, epigynum; 47, ventral view; 48, dorsal view. Scales in mm.

44) with the *mf* dark and narrowed in the center; *s* mostly fused to *cd*.

Variation.—A considerable range of dorsal patterns occurs from a bold pattern of light and dark marks to a more uniform dark color with only the subapical light transverse band present. Correspondingly, the pattern on the legs varies from a uniform color to a bolder pattern. Two lobes of the *pma* of the epigynum may be enlarged (Fig. 43) or inconspicuous.

These are rather large spiders with the average carapace length of 12 males of 9.65 (range 8.5–10.8) and mean carapace length of nine females of 9.3 (range 8.0–10.0).

Natural history.—Egg sacs were found with collections from Brazil (November, 15.3 diam.) and Peru (June, 24.0 diam.). A note with a male from Ecuador reads: “Spiders under bridge on surface or under water on vertical rock surfaces.”

Distribution.—Found in the upper Amazon River basin in eastern Ecuador, northeastern Peru, and in Brazil from the State of Rondônia northward and including the high altitude drainages of coastal rivers in southern Surinam and western Guyana. (Map 1).

Table 7.—Leg measurements in female of *Trechalea macconnelli*.

Leg segment	I	II	III	IV
Femur	17.1	18.7	12.7	17.0
Tibia-patella	22.2	23.7	15.8	20.2
Metatarsus	16.2	17.7	13.9	18.7
Tarsus	10.4	11.9	8.5	11.5
Total	65.9	72.0	50.9	67.4

Specimens examined.—**BRAZIL:** *Amazonas:* Manaus, Reserva Ducke, on side of swimming pool, 30 Mar. 1986 (J. Adis), 2♂ (INPA); *Rondônia:* Porto Vieho, Rio Jamari, 27 Dec. 1988 (Equipe Operação Jamari), 1♂ (MCN); 18 Nov. 1988 (Equipe Operação Jamari), 8♀ 1 juv. (MCN). **ECUADOR:** *Pastaza:* Cusuimi, on Rio Cusuimi, 320 m, 1–5 June 1971 (B. Malkin), 2♂ (FMNH); Cusuimi, on Rio Cusuimi, 150 km SE of Puyo, 15–22 May 1971 (B. Malkin), 1♂ 2♀ 1 juv. (FMNH); *Morona-Santiago:* Yanzatza, 33.4 km N, El Pincho, 820 m (J. A. Anderson), 1♂ (USNM). **PERU:** *Loreto:* Rio Yarapa, 80 km S Iquitos, June 1986 (J. & K. Ribardo), 1♀ (CAS); Rio Ampiacu, 13 Nov.–19 Dec. 1961 (B. Malkin), 1♀ 1 juv. (AMNH); *Aquaitia,* 170 m, 1–2 Sept. 1946 (F. Woytowski), 1♀ 1 juv. (AMNH); *Huanuco:* Tingo Maria, 670 m (Weyrauch), 1♂ (CAS); Tingo Maria, 43 mi. E (E. I. Schlinger & E. S. Ross), 1♂ (CAS). **SURINAM:** Berg-en-del [dal?], May 1892 (E. W. Ellacombe), 1♀ (holotype of *T. ellacombei* F. Pick.–Camb.) (BMNH); Litani, Fetibreek, 15 Sept. 1939 (Gercher), 1♂ (USNM); Keyserberg airstrip, E of Zuid River (no date) (H. Baetty), 1♀ (FMNH).

Trechalea paucispina Caporiacco
 Figures 18, 28, 45–48; Map 1

Trechalea paucispina Caporiacco, 1947:22 (The holotype is a female from Presso, Great Falls, Demerda, Guyana, collected September 1931 by Beccari and Romiti, deposited in the Museo Zoologico della Specola, Firenze, Italy, examined). Caporiacco, 1948: 633, figs. 24–26. Roewer, 1954:143.

Diagnosis.—Both sexes are distinguished by details of their genitalia. The palpal bulb has a distinctive shape of the median apophysis guide distally (Fig. 18), and the tibial apophysis ectal division truncated apically (Fig. 28). The epigynum externally has the middle field flared along the middle of its length over medial projections from lateral lobes and the posterior margin of the anterior field projecting posteriorly (Fig. 47).

Description.—*Male:* (Canje Ikuruwa River, Guyana). Carapace low, cephalic area somewhat elevated, length 8.0, width 7.5, medium brown medially with distinct submarginal bands, dark at lateral margins and in eye region. Sternum

Table 8.—Leg measurements in male of *Trechalea paucispina*.

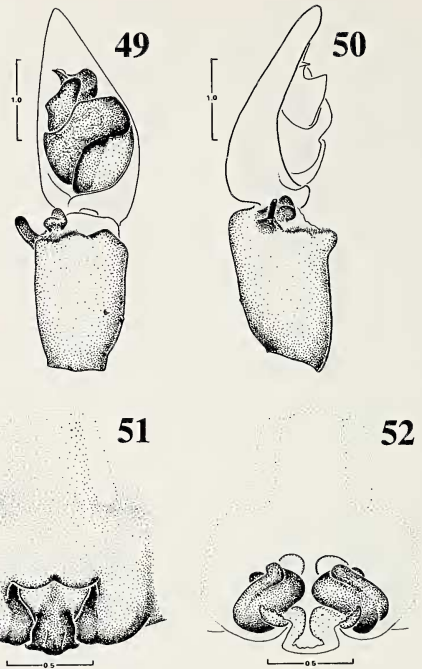
Leg segment	I	II	III	IV
Femur	13.3	14.2	11.3	14.7
Tibia-patella	16.9	18.1	13.2	17.2
Metatarsus	13.2	14.2	10.8	16.1
Tarsus	8.5	8.9	7.5	10.3
Total	51.9	55.4	42.8	58.3

light, unmarked, length 4.1, width 3.8; labium dark brown, darker laterally at basal half, lighter at distal margin, length 1.65, width 1.38. Clypeus height 0.78, width 3.70. Anterior eye row straight, a cluster of bristles posterior to each PLE, eye measurements in Table 1. Chelicerae face dark, clothed with light hairs and longer more erect dark hairs, an oblique groove above fang and a short longitudinal carina laterally, three retro-marginal teeth equal in size with distal two slightly closer together. Legs IV-II-I-III, measurements in Table 8, ventral macrosetae pairs on tibiae are I-4, II-5, III-4, IV-3. Color of legs generally light with distinct markings on prolateral surfaces of all femora and tibiae-patellae. Abdomen length 7.3, hairy above with a distinct pattern including transverse marks in the posterior third, light ventrally. Palpus (Figs. 45, 46), *ma* (Fig. 18) with *g* winged apically, *rta* (Fig. 28) with *ecd* straight, truncated apically.

Female: (Canje Ikuruwa River, Guyana). Carapace shape and color as in male, length 8.2, width 8.2. Sternum light, unmarked, length 4.3, width, 4.0; labium color as in male, length 1.76, width 1.48. Clypeus height 0.80, width 4.05. Anterior eye row straight, eye measurements in Table 1. Chelicerae face dark, clothed with light hairs and scattered longer more erect dark hairs. Legs IV-II-I-III, measurements in Table 9, ventral macrosetae pairs on tibiae I-4, II-4, III-3, IV-3. Color of legs as in male. Abdomen length 9.5, hairy above, color as in male. Epigynum (Figs. 47, 48) with the *mf* narrowed centrally and flared laterally over *ll* and the *pma* projecting posteriorly; *s* mostly fused to *cd*.

Variation.—Of eight females measured, the average carapace length is 8.1 (range 7.4–9.2). The only male available had the carapace length of 8.0.

Natural history.—Most collection labels indicate that the specimens were taken from rivers, however a collection from Guyana also includes the notation; “forest savanna”. Three egg sacs



Figures 49–52.—Genitalia of *Trechalea connexa*: 49, 50, right palpus (Veracruz, Mexico); 49, ventral view; 50, retrolateral view; 51, 52, epigynum (Morelos, Mexico); 51, ventral view; 52, dorsal view. Scales in mm.

found with females average 17.3 (13.7–24.0) and are of the typical trechaleid structure.

Distribution.—Amazon River tributaries in northwestern Brazil and central Peru northward into the coastal river drainages of Guyana. (Map 1).

Specimens examined.—GUYANA: Canje Ikuruwa River, 57.50W:5.70N, Aug.-Dec. 1961 (G. Bently), 1♂ 2♀ (AMNH); Shudicar River, upper Essequibo River, 1 Jan. 1938 (W. G. Hassler), 1♀ (AMNH). PERU: Loreto: Aquaitia [Aguaytia R.], 170 m, 1–2 Sept. 1946 (F. Woytkowski), 1♀ (AMNH). BRAZIL: Amazonas: Ica (Thayer Expedition), 1♀ (MCZ); Rondônia: Jamari, #18568, 18 Nov. 1988 (Equipe Operação Jamari), 1♀ (MCN); Acre: Río Purus NW of Sena Madureira Seringal Santo Antonio (above Manuel Urbano), 15–18

Table 9.—Leg measurements in female of *Trechalea paucispina*.

Leg segment	I	II	III	IV
Femur	12.6	13.8	11.0	14.3
Tibia-patella	16.3	17.3	13.0	17.3
Metatarsus	11.8	12.8	10.4	15.9
Tarsus	7.6	8.3	7.3	10.0
Total	48.3	52.2	41.7	57.5



Map 2.—Distribution of species of *Trechalea* in USA, Mexico and Central America. ● = *T. gertschi*, ■ = *T. connexa*, ▲ = *T. extensa*.

Sept. 1973 (B. Patterson), 1♀ (MCZ); Pará: Río Mapu-putra [Río Mapuera?] 10 mi. S of Equator, 8–9 Feb. 1938 (W. G. Hassler), 1♀ (AMNH).

Trechalea connexa (O. Pickard-Cambridge)
 Figures 19, 29, 49–52; Map 2

Triclaria connexa O. Pick.-Camb., 1898:233 (The holotype is a male from Atoyác, Veracruz, Mexico, collected by H. H. Smith, deposited in The Natural History Museum, London, examined).

Trechalea connexa, F. O. Pick.-Camb., 1902:312, 313. Petrunkevitch, 1911:548. Roewer, 1954:142. Bonnet, 1955–1959:4679.

Diagnosis.—Both sexes are distinguished by details of their genitalia. The median apophysis (Fig. 19) differs from *T. gertschi* in details of the guide and ventral division. The retrolateral tibial apophysis also resembles that of *T. gertschi* but is thinner (Fig. 29). In the female, the middle field is narrowed centrally but is flared distally (Fig. 51) while the same structure in *T. gertschi* is broad throughout without distinct central narrowing.

Description.—*Male*: (Fortín, Veracruz, Mexico). Carapace low, cephalic area not elevated, length 6.5, width 6.2, medium brown with indistinct light areas laterally, dark at margin and in eye region; sternum light, unmarked, length 3.5, width 3.3; labium dark brown, lighter distally, an irregular, longitudinal furrow at the basal half on each side. Clypeus height 0.67, width 3.00. Anterior eye row straight, eye measurements in Table 1. Chelicerae face medium brown, smooth, almost glabrous medially with hairs peripherally, an oblique groove above each fang

Table 10.—Leg measurements in male of *Trechalea connexa*.

Leg segment	I	II	III	IV
Femur	9.5	11.0	9.1	10.7
Tibia-patella	12.5	14.0	10.9	13.2
Metatarsus	9.7	6.3	9.0	12.4
Tarsus	5.6	6.1	5.3	7.2
Total	37.3	37.4	34.3	43.5

and a longitudinal carina laterally on distal one-third of its length, three retromarginal teeth equal in size and equidistant. Legs IV-(II-I)-III, measurements in Table 10, ventral macrosetae pairs on tibiae are I-4, II-4, III-4, IV-4. Color of legs generally light with a faint pattern on prolateral surface of femora and tibiae. Abdomen length 6.1, hairy above with reticulated pattern of dark pigment, darker posteriorly and with light spots anteriorly around muscle attachments and around anterior margin; light ventrally. Palpus (Figs. 49, 50), *ma* (Fig. 19) with *g* winged apically; *rta* (Fig. 29) with *ecd* flattened, rounded apically.

Female: (Cuernavaca, Morelos, Mexico). Carapace shape and color as in male, length 7.2, width 7.0; sternum light, unmarked, length 3.5 width 3.6; labium color as in male, length 1.45, width 1.25. Clypeus height 0.75, width 3.36. Anterior eye row straight, eye measurements in Table 1. Chelicerae face dark, clothed with scattered short, light hairs and scattered, longer, more erect hairs. Legs IV-II-I-III, measurements in Table 11, ventral macrosetae pairs on tibia are I-4, II-4, III-3, IV-3. Color of legs as in male. Abdomen length 8.0, hairy above, pattern in poor condition but similar to male. Epigynum (Figs. 51, 52) with *mf* flared and grooved posteriorly; *s* mostly fused to *cd*.

Variation.—In alcohol, the dorsum shows a radiating group of dark lines on the carapace with vague evidence of irregular submarginal bands, while the abdomen is generally dark with varying light marks near the anterior margin including the cardiac area, and around the abdominal muscle apodemes. The average carapace lengths of 14 males is 7.45 (range = 6.1–9.3) and of 25 females is 7.63 (range 6.4–9.25).

Natural history.—Little biological data are contained with the specimens and are limited to two references to the vicinity of water. Egg sacs are in four collections which are 12.7, 14.5, 10.8, and 17.8 diameter from April, June, July, and August respectively.

Table 11.—Leg measurements in female of *Trechalea connexa*.

Leg segment	I	II	III	IV
Femur	9.3	10.9	9.4	10.6
Tibia-patella	12.5	13.1	11.4	14.3
Metatarsus	8.9	10.2	8.9	11.7
Tarsus	5.5	6.0	5.5	6.7
Total	36.2	40.2	35.2	43.3

Distribution.—From the Isthmus of Tehuantepec of Mexico northwestward through central Veracruz on the Atlantic coast to southern Jalisco on the Pacific coast. (Map 2).

Specimens examined.—MEXICO: Veracruz: Fortín, 28 April-1 May 1944 (C. Bolívar & I. Piña), 2♂ (AMNH); Oaxaca: Tehuantepec, 22 Dec. 1947 (T. McDougall), 1♂ (AMNH); Morales: Cuernavaca, 1 April 1942, 1♀ (AMNH); Guerrero: Colotlipa, Río Blanco, 1 Aug. 1941, 1♀ (AMNH); Jalisco: 5 mi. N Pihuamo 2350 ft., 5 Aug. 1967 (R. E. Leech), 1♀ (REL); Sinaloa: Camino Real de Piaxtla, 4 May 1949 (G. W. Bradt), 3♀ (AMNH); Nayarit: Tepic, 2 Aug. 1947 (C. Goodnight), 1♀ (AMNH), 2-7 Aug. 1947 (C. & M. Goodnight & B. Malkin), 5 mi. NW Tepic, 13 May 1963 (W. J. Gertsch & W. Ivie), 5♂ 3♀ 2 juv. (AMNH), Mecatan 800 ft., 2 May 1949 (G. M. Bradt), 1♂ 2♀ 1 juv. (AMNH), Jesus María, 25 June 1955 (B. Malkin), 4♂ 8♀ (AMNH), 1-15 July 1955 (B. Malkin), 1♂ 3♀ (AMNH), 22-30 June 1955 (B. Malkin), 1♂ (AMNH), July 1955 (B. Malkin), 1♀ (AMNH), Arroyo Santiago, 3 mi. NW Jesus María, 4-6 July 1955 (B. Malkin), 1♀ (AMNH), 4 July 1955 (B. Malkin), 1♀ (AMNH).

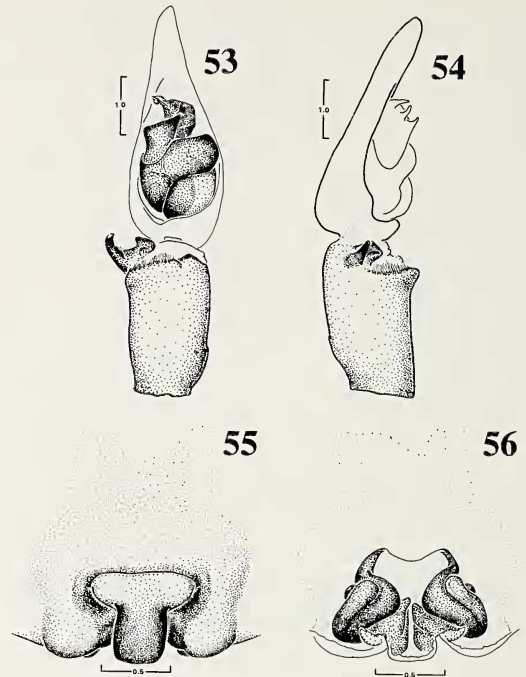
Trechalea extensa (O. Pickard-Cambridge)
Figures 20, 30, 53-56; Map 2

Triclaria extensa O. Pickard-Cambridge, 1896, 1:174-175 (The holotype is a male from Rokminhí, Guatemala, collected by Sarg, deposited in The Natural History Museum, London, examined).

Trechalea extensa, F. Pickard-Cambridge 1902, 2:313. Petrunkevitch, 1911:549. Roewer, 1954, 2a:143. Bonnet, 1955-1959:4679.

Trechalea magnifica Petrunkevitch, 1925:169-170 (The syntypes are from Wilcox dam on San Lorenzo River, Bocas Del Monte, La Mesa and Santiago, Panama, deposited in the Museum of Comparative Zoology, examined). Roewer, 1954:143. Bonnet, 1955-1959:4679. NEW SYNONYMY.

Diagnosis.—Both sexes are distinguished from other species by details of the genitalia. The median apophysis of the male palpal bulb bears a distinct tubercle between the guide and ventral division (Fig. 20), a feature shared only with *T. longitarsis* (Fig. 15). *Trechalea extensa* differs



Figures 53-56.—Genitalia of *Trechalea extensa* (Canal region, Panama): 53, 54, right palpus; 53, ventral view; 54, retrolateral view; 55, 56, epigynum; 55, ventral view; 56, dorsal view. Scales in mm.

from the latter species by the length of the cymbium which is distinctly less than half the length of the bulb (Fig. 53). The middle field of the epigynum is short and usually with the sides almost parallel (Fig. 55). See diagnosis of *T. longitarsis* for other comparisons.

Description.—*Male*: (Barro Colorado Island, Lago Gatún, Panama). Carapace low, cephalic area not elevated, length 8.8, width 8.1, light brown background color with lighter submarginal bands more distinct posteriorly, dark at lateral margins, in eye region and a spot on each side of clypeus. Sternum light, unmarked, length 4.5, width 4.3; labium dark brown, lighter at distal margin, length 1.80, width 1.62. Clypeus height 1.05, width 4.08. Anterior eye row straight, a cluster of bristles posterior to each PLE, eye measurements in Table 1. Chelicerae face dark, clothed with light hairs mostly in proximal two-thirds, an oblique groove above fang and a longitudinal carina laterally on distal half, three retromarginal teeth of equal size with distal two closer together. Legs II-IV-I-III, measurements in Table 12, ventral macrosetae pairs on tibiae I-4, II-4, III-3, III-3. Color of legs generally light except for distinct dark marks on prolateral sur-

Table 12.—Leg measurements in male of *Trechalea extensa*.

Leg segment	I	II	III	IV
Femur	14.3	16.2	12.5	16.1
Tibia-patella	19.4	20.4	14.7	19.7
Metatarsus	15.1	17.1	12.4	15.3
Tarsus	10.0	11.0	8.3	12.4
Total	58.8	64.7	48.0	63.5

face of all legs. Abdomen length 9.2, hairy above, color a reticulated pattern of dark pigment with distinct small, scattered, dark spots, and lighter in cardiac area and a pair of indistinct spots in the posterior third, light ventrally. Palpus (Figs. 53, 54), *ma* (Fig. 20) with *g* winged apically, and with distinct distal tubercle situated between *g* and *vd*; cymbium/palpal bulb length ratio 1.67. The *rta* (Fig. 30) with *ecd* flattened and hooked distally and serrated along inner margin.

Female: (Barro Colorado Island, Lake Gatún, Panama). Carapace shape and color as in male but with markings more distinct, length 8.8, width 8.5. Sternum light, unmarked, length 4.5, width 4.3; labium color as in male, length 1.74, width 1.52. Clypeus height 1.06, width 4.00. Anterior eye row straight, eye measurements in Table 1. Chelicerae color, teeth, and hair as in male but with the addition of longer and more erect hairs grouped mostly in longitudinal rows. Legs IV-II-I-III, measurements in Table 13, ventral macrosetae pairs on tibiae I-5, II-4, III-4, IV-4. Color of legs as in male. Abdomen length 11.6, color and hair as in male. Epigynum (Figs. 55, 56), *mf* sides almost parallel; *s* mostly fused to *cd*.

Variation.—The average carapace length of 19 males is 9.05 (range 8.3–10.0), and the average carapace length of 32 females is 9.38 (range 8.2–12.0). The average cymbium length/palpal bulb length ratio of 19 males is 1.72 (range 1.60–1.88). The width of the middle field of the epigynum is wider in specimens in the northern part of the range.

The retromarginal cheliceral teeth number is typically three, but two males from Panama had four on only one side. One specimen had the fourth a full-sized tooth while the second had only a tiny added tooth at the base of another tooth.

Natural history.—These spiders are a distinctive feature of the streams of Panama and Costa Rica. They seem to be completely restricted to

Table 13.—Leg measurements in female of *Trechalea extensa*.

Leg segment	I	II	III	IV
Femur	13.1	15.0	11.9	15.3
Tibia-patella	17.2	19.0	13.9	18.7
Metatarsus	12.9	14.6	11.4	18.1
Tarsus	8.0	9.1	7.6	10.0
Total	51.2	57.7	44.8	62.1

the stream margins and bases of emergent rocks and debris. They have been collected from large, open-canopied rocky streams and from first-order streams in vegetational thickets. They bite readily the collector's hand. Van Berkum (1982) has reported an apparent preference for shrimps as prey in Rincón de Osa in Panama.

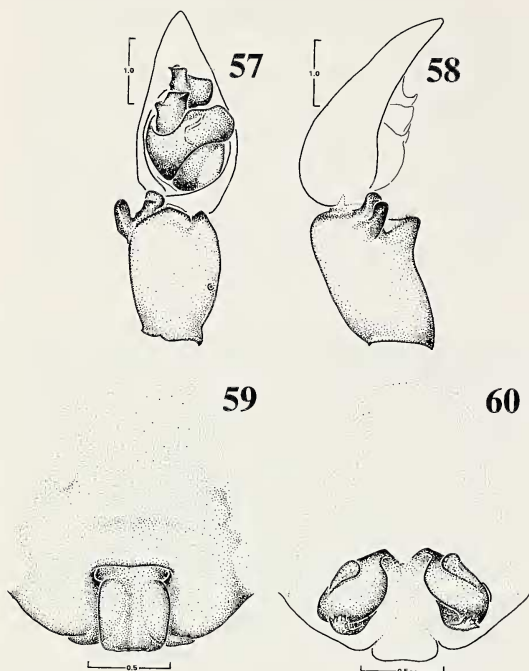
Egg sacs are in five collections; the average of four is 13.9 (range 10.0–15.5) collected during the months of May and June.

Distribution.—In Central America ranging from Central Panama in the south to the Mexican state of Chiapas in the north. (Map 2).

Specimens examined.—**PANAMA:** (Central area around Canal, summary of several collections), 5♂ 13♀, several juv.; El Valle de Anton, 1 April 1945 (C. D. Michener), 1♂, 1♀ (AMNH); El Valle, July 1936 (A. M. Chickering), 1♀ (MCZ); river 10 km W of David, 8 Aug. 1983 (Carico, Coyle, Eberhard, Coddington), 9♂ 2♀ several juv. (JEC). **COSTA RICA:** river 5.3 km N of Las Cañas on Rt. #19, 11 Aug. 1983 (Carico, Coyle, Vogel), 2♂ 1♀ (JEC); San Antonio de Escazú, near San José, 14 Aug. 1983 (J. E. Carico), 1♀ (JEC), May 1984 (W. Eberhard), 1♀ (MCZ); Puntarenas, Esterillos, 20 June 1970 (D. C. Robinson & R. Saëña), 1♀ (MZUCR); 18 km S of San Isidro del General, 2–3 June 1972 (J. Baldrige), 1♀ (MZUCR); Butler's Finca 9°18': 83°04'W, 28 Jan. 1976 (Roth-Schroepfer), 1♀ (AMNH); Los Diamantes, Guapiles (C. E. Valerio), 1♀ (MZUCR); San Mateo (N. Banks), 1♀ (MCZ); Tilarán (C. E. Valerio), 1♂ (MZUCR). **HONDURAS:** Copán (R. V. Chamberlin), 2♀ 5 juv. (AMNH), Lancetilla, July 1929 (A. M. Chickering), 3♀ 3 juv. (MCZ). **MEXICO:** Chiapas: 5.6 mi. SE Chiapa de Corzo, 2500 ft., 16 Aug. 1966 (D. E. Breedlove & J. Emmel), 1♀ (CAS), Mapastepec, June–July, 1940 (H. Wagner), 1♀ (AMNH), Rancho la Esperanza, 40 km Escuintla, 22 Jan. 1945 (T. C. Schneirla), 1♀ (CAS). **NICARAGUA:** Polvón (McNeill), 1♂ 2♀ (MCZ).

Trechalea gertschi Carico & Minch
Figures 21, 31, 57–60; Map 2

Trechalea gertschi Carico & Minch, 1981:154–156, figs. 1–4 (Male holotype from 9 mi. S of Sunflower, Maricopa County, Arizona, USA, collected by E. Minch,



Figures 57-60.—Genitalia of *Trechalea gertschi* (Arizona, USA): 57, 58, right palpus; 57, ventral view; 58, retrolateral view; 59, 60, epigynum; 59, ventral view; 60, dorsal view. Scales in mm.

9 June 1979, deposited in the American Museum of Natural History, examined). Brignoli, 1983:700. Platnick, 1989:389.

Diagnosis.—In the male, the median apophysis has the ventral division truncated apically and a notch retrolaterally (Fig. 21). The ectal division of the retrolateral tibial apophysis is a rounded projection flattened ventrally and often with a serrated surface (Fig. 31). The median field of the epigynum is flattened and overlapping the lateral lobes (Fig. 59).

Description.—*Male*: (Holotype). Carapace length 7.0, width 7.4., moderately low with ocular area dark, marginal band dusky, serrated submarginal light band, median light band extending from thoracic groove to posterior margin of carapace. Sternum light, unmarked, length 3.6, width 3.8; labium dark, with transverse groove, length 1.6, width 1.4. Clypeus height 0.75, width 3.60. Anterior eye row slightly recurved, eye measurements in Table 1. Chelicerae face dark with three equal sized retromarginal teeth, distal two closer. Legs IV-II-I-III, measurements in Table 14, ventral macrosetae pairs on tibiae are I-4, II-4, III-3, IV-3. Color of legs light with faint band on dorsal side of femora, patellae-tibiae.

Table 14.—Leg measurements in male of *Trechalea gertschi*.

Leg segment	I	II	III	IV
Femur	10.0	12.0	9.6	11.2
Tibia-patella	13.4	15.5	11.6	14.2
Metatarsus	10.0	11.8	9.4	13.5
Tarsus	5.5	6.5	5.5	7.6
Total	38.9	45.8	36.1	46.5

Abdomen length 6.0, dorsum has irregular darker mottling clothed with several black, long setae, venter light and unmarked except for black setae in genital area. Palpus (Figs. 57, 58), *ma* (Fig. 21) with *g* winged on either side, *vd* truncated distally with retrolateral notch and transverse grooves, *rt* (Fig. 31) with *ecd* with uniform width, rounded apically, ventral side flattened with serrated surface. (Figs. 21, 31 from another male from type locality).

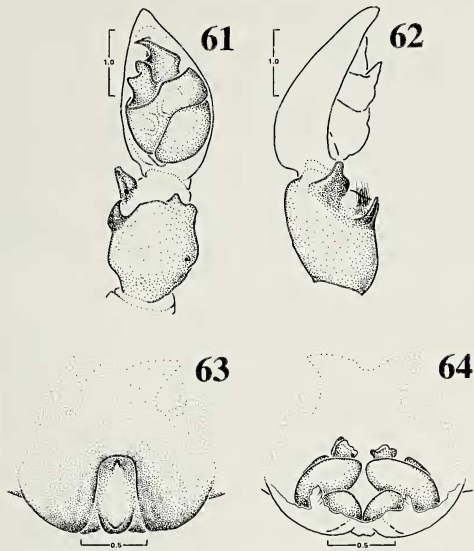
Female: (Paratype). Carapace shape and color as in male, length 7.9, width 7.4. Sternum light, unmarked, length 4.0, width 4.0.; labium similar to male, length 1.60, width 1.50. Clypeus height 0.80, width 3.70. Anterior eye row straight, eye measurements in Table 1. Chelicerae as in male. Legs IV-II-III-I(?), measurements in Table 15, ventral macrosetae pairs on tibiae I-4, II-2, III-3, IV-3. Color of legs as in male. Abdomen length 8.5, color pattern as in male. Epigynum (Figs. 59, 60) has the *mf* broad with an anterior constriction and overlapping *ll* posteriorly.

Variation.—The average carapace length of 20 males is 7.59 (range 6.8-8.4), and the average carapace length of 21 females is 7.57 (range 6.8-8.9).

Natural history.—All instars of individuals are found restricted to the margins of apparently permanent streams within the xeric regions. Typically they are found on the surfaces of rocks and pebbles of varying sizes near the water margin. They readily run across water and occasionally crawl underwater by walking down the surface

Table 15.—Leg measurements in female of *Trechalea gertschi*.

Leg segment	I	II	III	IV
Femur	10.5	12.5	11.0	12.5
Tibia-patella	13.9	16.5	13.3	14.6
Metatarsus	10.0	12.2	10.7	14.7
Tarsus	6.2	—	6.1	8.1
Total	40.6	—	41.1	49.9



Figures 61–64.—Genitalia of *Trechalea amazonica* (Amazônia, Brazil): 61, 62, right palpus; 61, ventral view; 62, retrolateral view; 63, 64, epigynum; 63, ventral view; 64, dorsal view. Scales in mm.

of a partly submerged rock. Females carry egg sacs by the spinnerets and show other typical trechaleid behavior described above.

Five egg sacs were found with the collections. Their dates and sizes (stated only if in a condition to measure) are: 25–27 June (3 egg sacs, 18.8 & 19 mm), 6 July (1 egg sac, 15 mm), 17 July (2 egg sacs). Two apparently gravid females were in collections made in January and July.

Distribution.—From Yavapai County of central Arizona, USA southward into the Mexican states of Sonora and Chihuahua. (Map 2).

Material examined.—USA: *Arizona*: Maricopa County, 9 mi. S Sunflower, 3 June 1979, (E. Minch), 1♂ 2♀, (AMNH), 11 July 1979, (E. Minch), 2♂, (AMNH); Yavapai County, Clear Cr., 11 mi. E Camp Verde, 25–27 June 1986, (J. E. Carico), 4♀, (JEC); Pinal County, Sycamore Cr. 30 mi. NE Apache Junction, 28 June 1986, (J. E. & E. L. Carico, E. Minch), 3♂ 1♀, (JEC); Pima County., Sabino Canyon, Santa Catalina Mts. nr. Tucson, 1 Sept. 1939, (R. H. Crandall), 1♂ 1♀, (AMNH), 5 Oct. 1937, (Crandall), 1♂, (AMNH), 6 July 1939, (R. A. Flock), 1♀, (MCZ), 17 July 1971, (J. E. Carico), 3♂ 6♀, (AMNH); Santa Cruz County, Santa Rita Mts., 1♀, (AMNH); Gila County, Gisela, 5 Nov. 1977, (E. Minch), 1♂, (AMNH). **MEXICO**: *Sonora*: 6 mi. E Alamos, Río Cuchujachi, 22 June 1966, (V. Roth) 6♂ 3♀ (AMNH); SE Alamos on Río Cuchujaqui, Jan. 1968, (V. Roth), 1♂ 3♀, (AMNH); 57 mi. SE Aqua Prieta on bank of Río El Batista [Bavispe], 26 June 1972, (G. Dingerkus),

Table 16.—Leg measurements in male of *Trechalea amazonica*.

Leg segment	I	II	III	IV
Femur	8.9	9.0	7.5	9.7
Tibia-patella	11.3	10.9	8.5	10.8
Metatarsus	7.7	7.8	6.8	10.4
Tarsus	4.5	4.7	4.5	6.0
Total	32.4	32.4	27.3	36.9

1♀, (AMNH); *Chihuahua*: Urique Río, 21 April 1986, (V. D. Roth), 1♂, (JEC).

Trechalea amazonica F. O. Pickard-Cambridge
Figures 22, 32, 61–64; Map 3

Trechalea amazonica F. O. Pickard-Cambridge, 1903: 163, plate 15, figs. 18–20 (The holotype is a male from Santarem, Amazônia, Brazil, collected by F. O. Pickard-Cambridge 1895–1896, deposited in The Natural History Museum, London, examined; two female paratypes with holotype from the same locality).

Trechalea manauensis Carico, in Carico et al., 1985, 6(7):289–294, figs. 1–4 (The holotype is a male from Iha de Marchantaria, Río Solimões (near Manaus), Amazônia, Brazil, collected by J. Adis, 28 June 1981, deposited in the Systematic Entomology collection of Instituto de Pesquisas da Amazônia, examined; female paratype from the same locality). Platnick, 1989:398. NEW SYNONYMY.

Diagnosis.—The palpal bulb is distinguished by the blade-like and dual rounded edge of the median apophysis ventral division (Fig. 22) and the relative size and shape of the components of the retrolateral tibial apophysis (Fig. 32). The epigynum is distinguished by the shape of the middle field (Fig. 63) and unique shape of the internal components (Fig. 64).

Description.—*Male*: (Holotype of *T. manauensis*). Carapace length 5.5, width 5.3, moderately low, light colored with indistinct markings and ocular area dark. Sternum light, unmarked, length 2.80, width 0.98; labium dark especially laterally, lighter at anterior margin, length 1.18, width 0.98. Clypeus height 0.60, width 2.70. Anterior eye row straight, eye measurements in Table 1. Chelicerae face swollen, dark, clothed with light hairs, an oblique groove above fang and a longitudinal carina laterally on distal one-half, three equal-sized retromarginal teeth with distal two closest. Legs IV-(I-II)-III, measurements in Table 16, ventral macrosetae pairs on tibiae are I-4, II-5, III-3, VI-3. Color of legs light with faint bands on dorsal side of fem-

Table 17.—Leg measurements in female of *Trechalea amazonica*.

Leg segment	I	II	III	IV
Femur	8.7	8.7	7.5	9.7
Tibia-patella	10.7	10.8	8.3	11.2
Metatarsus	7.1	7.4	6.9	10.3
Tarsus	3.5	4.4	4.3	6.0
Total	30.0	31.3	27.0	37.2

ora, patellae-tibiae, and metatarsus. Abdomen length 6.1, dorsum color a reticulated gray background, three pairs of diagonal gray maculae, numerous erect, dark setae anteriorly, venter unmarked on light background. Palpus (Figs. 61, 62), *ma* (Fig. 22) with *vd* flattened with two rounded projections and *g* tapered and curved at tip, *rta* (Fig. 32) with *end* large and pointed distally, *ecd* smaller, tapered, curved, acute with brush of long hairs separating the two divisions.

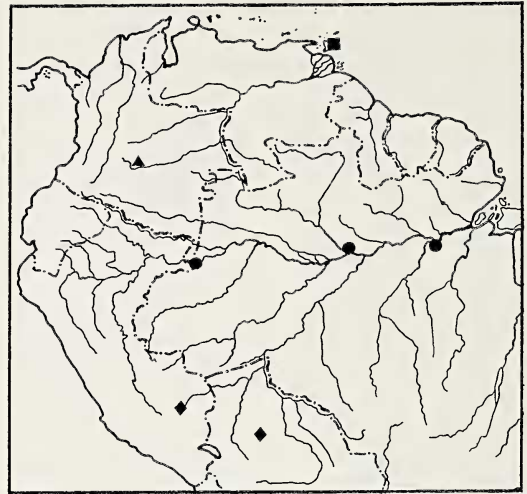
Female: (Paratype of *T. manauensis*). Carapace length 5.7, width 5.5, shape and color as in male. Sternum light, unmarked, length 2.95, width 2.75; labium similar to male, length 1.20, width 1.05. Clypeus height 0.57, width 2.80. Anterior eye row straight, eye measurements in Table 1. Chelicerae dark, clothed with light hairs, teeth as in male. Legs IV-(I-II)-III, measurements in Table 17, ventral macrosetae pairs on tibiae I-4, II-4, III-3, IV-3. Color of legs as in male. Abdomen length 7.0, color patterns as in male. Epigynum (Figs. 63, 64), *pma* extending posteriorly around *mf* to form U-shaped frame around *mf*. The posterior apex of the *mf* is black and somewhat set off from the light-colored anterior portion by a constriction.

Variation.—Average carapace length of six males is 5.45 (range 4.65–5.75) and average carapace length of 11 females is 5.9 (range 5.4–6.8).

Natural history.—Adis and Penny (in Carico et al. 1986) provide much detailed information on the natural history, behavior, and parasitism on this species which inhabits the inundation forests of the central Amazon River area. Six egg sacs were found in the collections; February (12.0 diam.), 31 March (3 egg sacs, 8.35, 8.5, 8.5), 28 April (9.6, [infested with chalcid wasps]), 31 May (9.8).

Distribution.—Known only from the main channel, Río Solimões and Río Amazônas in the state of Amazônas, Brazil. (Map 3).

Material examined.—BRAZIL: *Amazônas*: Ihla Marchantara, Solimões, 28 April 1981 (J. Adis), 3♂ 1♀,



Map 3.—Distribution of species of *Trechalea* in northern South America. ▲ = *T. lomalinda*, ■ = *T. trinidadensis*, ● = *T. amazonica*, ◆ = *T. boliviensis*.

16 Dec. 1987 (E. H. Buckup), 1♂, Río Solimões in *várzea* forest 15 km from Manaus, 31 March 1976 (J. Adis), 3♂ 4♀, Lago Janauacá nr. Río Solimões, 50 km from Manaus, no date (J. Adis), 3♀, Río Taruma Miriam, 20 km upstream from Manaus, 28 April 1976 (J. Adis), 1♀, (same locality), 31 May 1976 (J. Adis), 1♀, (previous specimens deposited variously in INPA, AMNH, JEC).

Trechalea boliviensis, new species

Figures 23, 33, 40, 65–68; Map 3

Type.—The holotype is a male from Bolivia, Dpto. Beni, Est. Biol. Beni, Zone 1, ca. 4°47'S: 66°15'W, ca. 225 m; collected 8–14 November 1989, by Coddington, Larcher, Penaranda, Griswold, and Silva, deposited in the Instituto de Ecología, La Paz, Bolivia. Female paratype from the type locality deposited in the United States National Museum.

Etymology.—The name means “from Bolivia,” the country of origin.

Diagnosis.—Both sexes are distinguished from those of all other species by the narrowed shape of the posterior third of the abdomen (Fig. 40), a patch of black hairs on the posterior apex of the abdomen, and details of the shape of their respective genitalia (Figs. 23, 33, 67, 68).

Description.—**Male:** (Holotype). Carapace low, cephalic area elevated, length 4.2, width 4.4, generally light but with dark on margin and black around each eye; sternum light, unmarked, length 2.55, width 2.4; labium dark, light at distal margin, with a longitudinal darker band in the basal

Table 18.—Leg measurements in male of *Trechalea boliviensis*.

Leg segment	I	II	III	IV
Femur	8.8	8.3	6.4	9.0
Tibia-patella	11.7	10.0	6.9	9.7
Metatarsus	8.6	7.6	5.9	9.9
Tarsus	5.3	5.0	4.1	6.1
Total	34.4	30.9	23.3	34.7

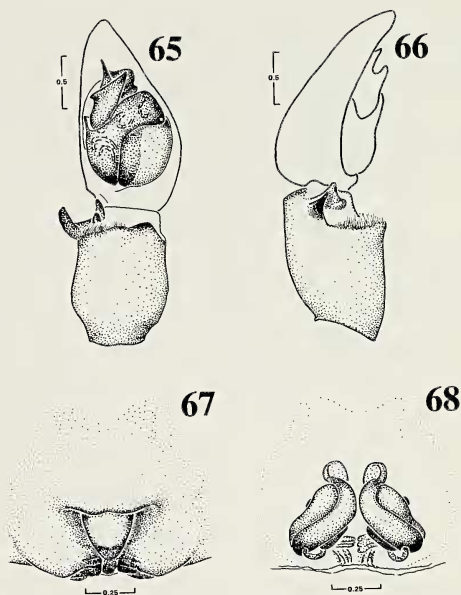
half on each side, length 0.88, width 0.72. Clypeus height 0.50, width 2.20. Anterior eye row straight, eye measurements in Table 1. Chelicerae face dark, basal segments clothed with light hair and a few larger, more erect dark bristles medially, oblique depression above fang, and longitudinal carina on distal one-third of lateral margin; three retromarginal teeth equal in size with distal two closer together. Legs IV-I-II-III, measurements in Table 18, ventral macrosetae pairs on tibiae are I-6, II-6, III-4, IV-4; color light ventrally with indistinct markings on other surfaces. Abdomen length 5.5, median cleft at anterior margin, narrowed posteriorly, irregular dark band laterally, irregular dorsal pattern (Fig. 40), light ventrally, patch of dark hairs at posterior apex. Palpus (Figs. 65, 66), *ma* (Fig. 23) with *g* acute and curved ventrally; *rta* (Fig. 33) with *ecd* with three lobes and *ecd* blade-like and slightly curved medially.

Female: (Paratype). Carapace shape and color as in male, length 4.5; width 4.5; sternum light, unmarked, length 2.75, width 2.35; labium as in male, length 0.98, width 0.80. Clypeus height 0.50, width 1.3. Anterior eye row straight, eye measurements in Table 1. Chelicerae face generally dark, darker distally, basal segments clothed with light hair and several more erect dark bristles, teeth as in male. Legs IV-I-II-III, measurements in Table 19, ventral macrosetae pairs on tibia I-6, II-6, III-4, IV-4; color as in male. Abdomen length 5.5, color as in male.

Epigynum (Figs. 67, 68) with *mf* triangular, light anteriorly, with dark and narrowed posterior apex; *s* fused to *cd* except distally, *ll* wrinkled posteriorly.

Variation.—Carapace length average of four males is 3.91 (range 3.7–4.2) and the two females have carapace lengths of 4.2 and 4.5.

Specimens examined and distribution.—**BOLIVIA:** Beni: (Type collection), 2♂ 2♀ (USNM). **PERU:** Cuzco: Quincemil, 750 m, August 1962 (Peña), 2♂ (MCZ). (Map 3).



Figures 65–68.—Genitalia of *Trechalea boliviensis* (Beni, Bolivia): 65, 66, right palpus; 65, ventral view; 66, retrolateral view; 67, 68, epigynum; 67, ventral view; 68, dorsal view. Scales in mm.

Trechalea lomalinda, new species

Figures 24, 34, 69–72; Map 3

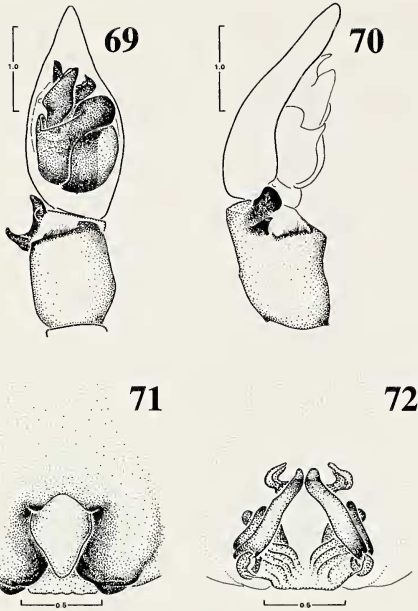
Type.—The holotype is a male from Lomalinda, Puerto Lleras, Meta, Colombia, 300 m elevation, collected 15 April 1986 by B. T. Carroll, deposited in the California Academy of Sciences Museum. Paratype female from the type locality, collected March 1987 by B. T. Carroll, deposited in the California Academy of Sciences Museum.

Etymology.—The name is a noun in apposition taken from the name of the type locality.

Diagnosis.—The ental division of male retrolateral tibial apophysis is more prominent than ectal division (Fig. 34). The dorsal division of the median apophysis has a unique prominent projection other than the guide (Fig. 24). In the female epigynum the middle field is triangular and entirely white (Fig. 71); the copulatory duct is distinctively narrow (Fig. 72).

The first leg pair is longer than the second. The leg femora are slender and distinctly tapered.

Description.—**Male:** (Holotype). Carapace very low, cephalic area elevated, length 5.75, width 5.3, no distinct pattern and without black in the ocular area; sternum light, unmarked, length 3.1, width 2.7; labium dark reddish brown, light at distal margin, length 1.2, width 1.06. Clypeus height 0.70, width 2.87. Anterior eye row straight,

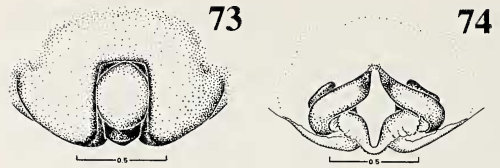


Figures 69-72.—Genitalia of *Trechalea lomalinda* (Meta, Colombia): 69, 70, right palpus; 69, ventral view; 70, retrolateral view; 71, 72, epigynum; 71, ventral view; 72, dorsal view. Scales in mm.

eye measurements in Table 1. Chelicerae face dark, clothed with conspicuous light hair proximally, and clothed sparsely distally with fine hairs, oblique depression above fang, and longitudinal carina on lateral margin; three retro-marginal teeth equidistant and equal in size. Legs IV-I-II-III, measurements in Table 20, ventral macrosetae pairs on tibiae are I-6, II-6, III-4, IV-4, color light ventrally with indistinct markings on other surfaces except for two oblique marks on the distal part of prolateral surface of femur III and a longitudinal mark on prolateral surface of patella III. Abdomen length 5.1, shrivelled and without apparent pattern. Palpus (Figs. 69, 70), *ma* (Fig. 24) with *dd* with a prominent projection besides the *g*. The *vd* relatively large and acute and hooked distally. The *rta* (Fig. 34) with

Table 19.—Leg measurements in female of *Trechalea boliviensis*.

Leg segment	I	II	III	IV
Femur	7.6	7.3	6.0	8.1
Tibia-patella	9.7	8.7	6.5	8.7
Metatarsus	6.4	6.0	5.3	8.5
Tarsus	4.0	4.2	4.1	5.6
Total	27.7	26.2	21.9	30.9



Figures 73, 74.—Epigynum of *Trechalea trinidadensis* (Trinidad): 73, ventral view; 74, dorsal view. Scales in mm.

end relatively prominent, flattened and rounded apically, *ect* directed laterad with acute tip turned mediad.

Female: (Paratype). Carapace shape as in male, indistinct light pattern on lighter background, dark at edge especially at edge of cephalic area, and dark in eye region, length 6.0, width 5.7; sternum light unmarked, length 3.15, width 2.8; labium color as in male, length 1.25, width 1.10. Clypeus height 0.73, width 3.0. Anterior eye row straight, eye measurements in Table 1. Chelicerae face dark, clothed with conspicuous light hair proximally, and clothed sparsely distally with fine hair on a glossy integument; teeth as in male. Legs IV-I-II-III, measurements in Table 21, ventral macrosetae pairs on tibiae are I-5, II-5, III-3, IV-3; dark pattern on legs most distinct on prolateral surfaces and missing from ventral surface of femora. Abdomen length 7.3, light ventrally, color dorsally composed of reticulated pattern of dark changing to fine lines posteriorly and laterally, light spots around muscle apodeme marks. Epigynum (Figs. 71, 72) with *mf* very light and triangular, *s* mostly fused to *cd*; *cd* narrow.

Variation.—The average carapace length of six males is 5.36 (range 5.0-5.75). The carapace lengths of two females are 5.9 and 6.0.

Natural history.—A note with one of the collections states: “grasslands; patches of jungle, woods, marsh. Indoors, daylight.”

Specimens examined and distribution.—Known only from Colombia, Depto. Meta, Pto. Lleras, Lomalinda

Table 20.—Leg measurements in male of *Trechalea lomalinda*.

Leg segment	I	II	III	IV
Femur	10.3	9.6	7.9	11.0
Tibia-patella	13.9	12.2	8.9	11.9
Metatarsus	9.9	9.0	7.4	11.5
Tarsus	6.1	6.0	5.8	7.9
Total	40.2	36.8	30.0	42.3

Table 21.—Leg measurements in female of *Trechalea lomalina*.

Leg segment	I	II	III	IV
Femur	9.6	9.8	8.1	10.8
Tibia-patella	12.3	11.7	9.0	11.9
Metatarsus	8.5	8.3	7.3	11.6
Tarsus	5.3	5.8	5.9	7.6
Total	35.7	35.6	30.3	41.9

(73°22'W:3°18'N), 300 m, from three collections by B. T. Carroll: 15 April 1986 (holotype) (CAS); March 1989, 1♀ (CAS); 7 March 1986, 5♂ 2♀ 1 juv. (JEC). (Map 3).

Trechalea trinidadensis, new species

Figures 73, 74; Map 3

Type.—The holotype is an adult female from Port-of-Spain, Trinidad, collected by Erik N. Kjellesvig-Waering on 28 May 1968, deposited in the American Museum of Natural History.

Etymology.—The name means “from Trinidad” taken from the name of the type locality.

Diagnosis.—This species is characterized by the unique long spines on the pedipalps, the spination pattern on the ventral side of the tibiae and details of the genitalia (Figs. 73, 74).

Description.—*Female*: (Holotype). Carapace moderately low, length 4.0, width 3.8, pattern obscured with light marginal area evident, black around each eye but none coalescing; sternum light, unmarked, length 2.05, width 2.00; labium moderately dark, light on apical margin, length 0.87, width 0.77. Clypeus height 0.41, width 1.90. Anterior row straight, eye measurements in Table 1. Chelicerae moderately dark, rubbed of setation, three retromarginal teeth, equidistant, proximal one smallest, distal two equal in size. Legs IV-II-I-III, ventral macrosetae pairs on tibiae are I-5, II-5, III-3, IV-2; measurements in Table 22, no pattern discernible. Pedipalp with macrosetae longer than tibiae. Abdomen length 5.1, marked with a distinct but irregular pattern

Table 22.—Leg measurements in female of *Trechalea trinidadensis*.

Leg segment	I	II	III	IV
Femur	6.0	6.1	5.1	7.0
Tibia-patella	7.6	7.5	5.9	7.7
Metatarsus	5.2	5.4	4.8	7.5
Tarsus	3.2	3.5	3.5	4.5
Total	22.0	22.5	19.3	26.7

dorsally, light ventrally. Epigynum (Figs. 73, 74) with the *pma* extending around the *mf* to form a squared U-shaped rim; the *mf* pale and bulbous anteriorly, narrowed and dark posteriorly.

Specimens examined and distribution.—Known only by the single type specimen. (Map 3).

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LITERATURE CITED

- Badcock, H. D. 1932. Reports of an expedition to Paraguay and Brazil in 1926–1927, etc. J. Linn. Soc. (Zoology), 38:1–48.
 Bertkau, P. 1880. Verzeichniss der von Prof. Ed. Van

- Beneden auf seiner im Auftrage der Belgischen. . . Mém. Cour. Acad. Belge, 43:1-129.
- Bonnet, P. 1955-1959. *Bibliographia Araneorum*. 2:1-5058.
- Brady, A. R. 1962. The spider genus *Sosippus* in North America, Mexico, and Central America (Araneae, Lycosidae). *Psyche*, 69:129-164.
- Brignoli, P. M. 1983. A Catalogue of the Araneae Described Between 1940 and 1981. (P. Merrett, ed.). Manchester Univ. Press. 755 pp.
- Bruce, J. A. & J. E. Carico. 1988. Silk use during mating in *Pisaurina mira* (Walckenaer) (Araneae, Pisauridae). *J. Arachnol.*, 16:1-4.
- Cambridge, F. O. Pickard-. 1902. Arachnida. Araneida. In *Biologia Centralia-Americana, Zoologia*. London, 2:313-424.
- Cambridge, F. O. Pickard-. 1903. On some new species of spiders belonging to the families Pisauridae and Senoculidae; with characters of a new genus. *Proc. Zool. Soc. London*. 1903:151-168.
- Cambridge, O. Pickard-. 1876. Catalogue of a collection of spiders made in Egypt, with descriptions of new species and characters of a new genus. *Proc. Zool. Soc. London*. 1876:541-630.
- Cambridge, O. Pickard-. 1881. On some new genera and species of Araneida. *Proc. Zool. Soc. Lond.*, 1881:765-775.
- Cambridge, O. Pickard-. 1896. Arachnida. Araneida. In *Biologia Centralia-Americana, Zoologia*. London, 1:161-224.
- Cambridge, O. Pickard-. 1897. Arachnida. Araneida. In *Biologia Centralia-Americana, Zoologia*. London, 1:225-232.
- Cambridge, O. Pickard-. 1898. Arachnida. Araneida. In *Biologia Centralia-Americana, Zoologia*. London, 1:233-288.
- Capocasale, R. M. 1982. Las especies del genero *Porrimosa* Roewer, 1959 (Araneae, Hipposinae). *J. Arachnol.*, 10:145-156.
- Caporiacco, L. di. 1947. Diagnosi preliminari di specie nuove di aracnidi della Guiana Britannica. *Monitore Zool. Italia*, 56:20-24.
- Caporiacco, L. di. 1948. Arachnida of British Guiana collected by Prof. Beccari. . . *Proc. Zool. Soc. London*. 118:607-747.
- Carico, J. E. 1972. The Nearctic spider genus *Pisaurina* (Pisauridae). *Psyche*, 79:295-310.
- Carico, J. E. 1973. The Nearctic species of the genus *Dolomedes* (Araneae: Pisauridae). *Bull. Mus. Comp. Zool.*, 144:435-488.
- Carico, J. E. 1981. The Neotropical spider genera *Architis* and *Staberius* (Pisauridae). *Bull. American Mus. Nat. Hist.*, 170:140-153.
- Carico, J. E. 1985. Description and significance of the juvenile web of *Pisaurina mira* (Walck.) (Araneae: Pisauridae). *Bull. British Arachnological Soc.*, 6:295-296.
- Carico, J. E. 1986. Trechaleidae: A "new" American spider family (abstract). p. 305, In *Proceedings of the 9th International Congress of Arachnology*. (W. G. Eberhard, Y. D. Lubin and B. C. Robinson, eds.). Smithsonian Inst. Press, 333 pp.
- Carico, J. E. 1993. Taxonomic notes on the genus *Architis* (Araneae, Pisauridae) and status of the genus *Sisenna* Simon. *J. Arachnol.*, 21:202-204.
- Carico, J. E., J. Adis & N. D. Penny. 1985. A new species of *Trechalea* (Pisauridae: Araneae) from Central Amazonian inundation forests and notes on its natural history and ecology. *Bull. British Arachnol. Soc.*, 6:289-294.
- Carico, J. E. & E. W. Minch. 1981. A new species of *Trechalea* (Pisauridae) from North America. *Bull. American Mus. Natur. Hist.*, 170:154-156.
- Chamberlin, R. V. 1916. Results from the Yale Peruvian expedition of 1911. *Bull. Mus. Comp. Zool.*, 60:177-299.
- Coddington, J. A. & H. W. Levi. 1991. Systematics and evolution of spiders (Araneae). *Annu. Rev. Ecol. Syst.*, 22:565-592.
- Davies, V. T. 1982. *Inola* nov. gen., a web-building pisaurid (Araneae: Pisauridae) from northern Australia with descriptions of three species. *Mem. Queensland Mus.*, 20:479-487.
- Dondale, C. D. & J. H. Redner. 1978. Revision of the Nearctic wolf spider genus *Schizocosa* (Araneida: Lycosidae). *Canadian Ent.*, 110:143-181.
- Dondale, C. D. & J. H. Redner. 1983a. Revision of the wolf spiders of the genus *Arctosa* C. L. Koch in North And Central America (Araneae: Lycosidae). *J. Arachnol.*, 11:1-30.
- Dondale, C. D. & J. H. Redner. 1983b. The wolf spider genus *Allocosa* in North and Central America (Araneae: Lycosidae). *Canadian Ent.*, 115:933-964.
- Dondale, C. D. 1986. The subfamilies of the wolf spiders (Araneae: Lycosidae). *Actas X Congr. Int. Arachnol. Jaca/España.*, 327-332.
- Exline, H. 1960. Rhoicinine spiders (Pisauridae) of western South America. *Proc. California Acad. Sci.*, IV series, 29:577-620.
- Forster, R. R. et al. 1990. A proposal and review of the spider family Synotaxidae (Araneae, Araneoidea), with notes on theridiid interrelationships. *Bull. American Mus. Nat. Hist.*, 193:1-116.
- Giebel, C. G. 1863. Drei und zwanzig neue und einige bekannte Spinnen der Hallischen Sammlung. *Zeits. Gesam. Naturw.*, 21:306-328.
- Griswold, C. E. 1993. Investigations into the phylogeny of the lycosoid spiders and their kin (Arachnida, Araneae, Lycosoidea). *Smithsonian Contributions to Zoology*, 539:1-39.
- Karsch, F. 1878. Exotisch araneologisches. *Zeits. Gesam. Naturw.*, 51:323-333, 771-826.
- Karsch, F. 1879. Arachnologische Beiträge. *Zeits. Gesam. Naturw.*, 52:534-562.
- Kaston, B. J. 1938. Family names in the order Araneae. *American Midl. Natur.*, 20:638-646.
- Kaston, B. J. 1948. Spiders of Connecticut. *Bull. Connecticut St. Geol. Nat. Hist. Surv.*, 70:1-874.

- Koch, C. L. 1848. Die Arachniden. Fünftzehnter Band. Nürnberg, 210 pp.
- Keyserling, E. G. 1877. Ueber amerikanische Spinnenarten der Unterordnung Citigradae. Verh. zool.-bot. Ges. Wien, 27:85–96.
- Keyserling, E. G. 1891. Die Spinnen Amerikas. Brasilianische Spinnen. Vol. 3. Nürnberg.
- Kraus, O. 1955. Spinnen aus El Salvador (Arachnoidea, Araneae). Abhand. der Senkenberg. Naturfor. Gesell., 493:1–121.
- Lehtinen, P. T. 1967. Classification of the Cribellate spiders and some allied families, with notes on the evolution of the suborder Araneomorpha. Ann. Zool. Fennici, 4:199–468.
- Lenler-Eriksen, P. 1969. The hunting-web of the young *Pisaura mirabilis*. J. Zool., 157:391–398.
- Mello-Leitão, C. 1926. Algumas aranhas do Brasil meridional. Bol. Mus. Nac. Rio-de-Janeiro, 2:1–18.
- Mello-Leitão, C. 1931. Arachnidos do Rio Grande do Sul. Bol. Biol. Rio de Janeiro, São Paulo, 17:10–14.
- Mello-Leitão, C. 1940a. Aranhas do Xingú colhidas pello Dr. Henry Leonardos. Anais Acad. Brasil. Cien., 12:2–32.
- Mello-Leitão, C. 1940b. Aranhas do Paraná. Arq. Inst. Biol. São Paulo, 11:235–257.
- Mello-Leitão, C. 1943. Alguns pisauridas e tomisidas do Brasil. Rev. Chilena Hist. Nat., 45:164–172.
- Mello-Leitão, C. 1947. Aranhas do Parana e Santa Catarina. . . Rio Archos Mus. Parananense, 6:231–304.
- Merrett, P. 1988. Notes on the biology of the neotropical pisaurid, *Ancylometes bogotensis* (Keyserling) (Araneae: Pisauridae). Bull. British Arachnol. Soc., 7:197–201.
- Nentwig, W. 1985. *Architis nitidopilosa*, a neotropical pisaurid with a permanent catching web (Araneae, Pisauridae). Bull. British Arachnol. Soc., 6:297–303.
- Nicolet, H. 1849. Arácnidos, In Gay C., Historia física y política de Chile. Zoología, III, Pp. 319–543.
- Perty, M. 1833. Arachnides Brasilienses. Pp. 191–209, In Delectus Animalium Articulatorum quae in itinere per Braziliam ann. 1817 et 1820 colligerunt. (J. B. deSpix & F. P. Martius, eds.). Monachii.
- Petrunkevitch, A. 1911. A synonymic index-catalogue of spiders. . . Bull. American Mus. Nat. Hist., 29:1–791.
- Petrunkevitch, A. 1925. Arachnida from Panama. Trans. Connecticut Acad. Arts Sci., 27:51–248.
- Platnick, N. I. 1979. A revision of the spider genus *Barrisca* (Araneae, Rhoicininae). J. Arachnol., 6:213–217.
- Platnick, N. I. 1989. Advances in Spider Taxonomy 1981–1987, etc. (P. Merrett, ed.). Manchester Univ. Press, 673 pp.
- Pocock, R. I. 1900. Myriapoda and Arachnida. In Report on a collection made by F. V. McConnell and J. J. Quelch at Mount Roriamia in British Guiana. Trans. Linn. Soc. London, 2:64–71.
- Roewer, C. F. 1954. Katalog der Araneae. 2a, Pp. 1–923.
- Roth, V. D. 1985. Spider Genera of North America. American Arach. Soc. 172 pp.
- Schmitt, A. 1992. Conjectures on the origins and functions of a bridal veil spun by the males of *Cupiennius coccineus* (Araneae, Ctenidae). J. Arachnol., 20:67, 68.
- Sierwald, P. 1989. Morphology and ontogeny of female copulatory organs in American Pisauridae, with special reference to homologous features (Arachnida: Araneae). Smithsonian Contrib. Zool., 484:1–24.
- Sierwald, P. 1990. Morphology and homologous features in the male palpal organ in Pisauridae and other spider families, with notes on the taxonomy of Pisauridae (Arachnida: Araneae). Nemouria, Occ. Pap. Delaware Mus. Natur. Hist., 35:1–59.
- Simon, E. 1890. Etudes arachnologiques. 22^e Mémoire. XXXIV. Etude sur les Arachnides de l'Yemen. Ann. Soc. Ent. France, 10:77–124.
- Simon, E. 1898a. Histoire Naturelle des Araignées. Tome 2, Fascicule 2, Paris, Pp. 193–380.
- Simon, E. 1898b. Descriptions d'arachnides nouveaux des familles des Agelenidae, Pisauridae, Lycosidae et Oxyopidae. Ann. Soc. Ent. Belge, 42:5–34.
- Simon, E. 1903. Histoire Naturelle des Araignées. Tome 2, Fascicule 4, Paris, Pp. 669–1080.
- Soares, B. A. M. & H. F. Camargo. 1948. Aranhas cologidas per la fundação Brasil Central. Bolm Mus. Para. Emilio Goeldi, 10:355–409.
- Taczanowski, L. 1873. Les Aranéides de la Guyane française. Horae Soc. ent. Ross., 10, Pp. 56–115, pl. II.
- Thorell, T. 1869. On European spiders. Part I. Review of the European genera of spiders, preceded by some observations on zoological nomenclature. Nova Acta Reg. Soc. Sci. Upsaliensis, 7:1–242.
- Thorell, T. 1895. Descriptive Catalogue of the Spiders of Burma. British Museum. 406 pp.
- Tullgren, A. 1905. Araneida from the Swedish expedition through the Gran Chaco and the Cordilleras. Ar. Zool., 2:1–81.
- Van Berkum, F. H. 1982. Natural history of a tropical, shrimp-eating spider (Pisauridae). J. Arachnol., 10:117–121.
- Wojcicki, J. P. 1990. The reproductive biology of *Dolomedes triton* (Walckenaer) (Araneae; Pisauridae). American Arachnol., 42:14. (abstract).
- Yaginuma, T. 1991. A new genus, *Shinobius*, of the Japanese pisaurid spider (Araneae: Pisauridae). Acta Arachnologica, 40:1–6.